PROSPECTIVE RANDOMISED STUDY ON POSTOPERATIVE ANALGESIA FOR CAESAREAN SECTION WITH INTRATHECAL BUPRENORPHINE

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(Branch – X) ANAESTHESIOLOGY

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CERTIFICATE

This is to certify that the dissertation work on **PROSPECTIVE RANDOMISED STUDY ON POSTOPERATIVE ANALGESIA FOR CAESAREAN SECTION WITH INTRATHECAL BUPRENORPHINE** is the bonafide work done by **Dr.P.Sasikumar**, Rajiv Gandhi Govt. General Hospital Madras Medical College, Chennai-600003 under my supervision and guidance in partial fulfilment of the regulations laid down by The Tamil Nadu Dr.M.G.R. Medical University, for the M.D., Anaesthesiology Branch X course during the academic period of May 2011 to April 2013

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DECLARATION

I, **Dr.P.SASIKUMAR** solemnly declare that this dissertation titled **PROSPECTIVE RANDOMISED STUDY ON POSTOPERATIVE ANALGESIA FOR CAESAREAN SECTION WITH INTRATHECAL BUPRENORPHINE** is a bonafide record of work done by me in the Department of Anaesthesiology, Govt. Kasturba Gandhi hospital for Women & children, Chennai – 600005, under the guidance of Professor Dr. NELLAIKUMAR, M.D., D.A., Department of Anaesthesiology, Govt. Kasturba Gandhi hospital for Women & Children, Chennai-600005.

This dissertation is submitted to The Tamil Nadu Dr.M.G.R. Medical University, Chennai, in partial fulfilment of the University regulations for the award of degree of M.D., Branch X (Anaesthesiology) examination to be held in April 2013.

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CONTENTS

INTRODUCTION

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FOR ALL THE HAPPINESS MANKIND CAN GAIN IS NOT IN PLEASURE IN REST FROM PAIN

- John Dryden

The International Association for the Study of Pain defines pain as an "unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage".

Surgical trauma and pain is a real problem to the patient during postoperative period. Yet after all the efforts taken to make the intra-operative period pain free and stress free, the patients are left to fend for herself in the post operative period.

Post operative pain unfortunately under treated that is usually written in single line as injection fortwin 1cc i.m bid. This is due to traditional fear of respiratory depression and addiction and also lack of knowledge of pharmacodynamics and kinetics of opioid analgesics.

As the anaesthesiologist alleviate pain of the patient he scores as the ideal person to manage postoperative pain.

Apart from obvious humanitarian reasons, postoperative pain increases morbidity and mortality.

ADVERSE EFFECTS OF PAIN

Respiratory system

Pain causes decreased pulmonary compliance, inability to breath and cough, a reflex increase in the tone of abdominal musculature during expiration and decreased diaphragmatic function. So it decreases functional residual capacity and FEV1 leading to hypoxia , hypercarbia, retension of secretions, atelectasis and pneumonia

Cardiovascular system

Pain stimulates the sympathetic nervous system resulting in tachycardia,increase in cardiac index , myocardial o2 consumption. If associated with hypoxia will lead to infarction. Decreased ambulation lead to venous stasis , increased risk of deep vein thrombosis and pulmonary embolism.

Gastro intestinal system

Pain causes nausea vomitting ,urinary retension and paralytic ileus

Neuroendocrine system

Pain increases sympathetic tone, increased catecholamine and catabolic hormones secretion(ACTH,ADH,Glucagon CAMP,Renin and Angiotensin II results in a catabolic state and Negative nitrogen balance.

Psychological

Pain causes fear anxiety, insomnia and apprehension

Importance of post operative system:

Post operative pain is not merely a symptom but the diseases itself. Adequate pain relief benefits a patient in following ways.

Reduction of metabolic and endocrine stress response.

Reduction of pulmonary complications.

Reduction of cardiovascular complication.

Reduced incidence of deep vein thrombosis.

Speedy recovery of gastro intestinal function.

Less urinary retention.

Prevention of chronic pain

Early mobilisation recovery and decreased hospital stay

Various technique has been tried as post operative pain relief , but spinal anaesthesia is a simple safe ad easier than other techniques. Spinal anaesthesia provides rapid onset and profound neuroblockade resulting in reduced need of

supplemental analgesics. Adjuvant agents used along with local anaesthetics in caesarean delivery improve the quality of intraoperative anaesthesia, prolong postoperative analgesia, and reduce the dose, and therefore the side effects, of local anaesthetics.

OPIOID-LOCAL ANAESTHETIC MIXTURES

The goal of combining spinal opioids and local anaesthetics is to use lower doses of each agent, to maintain good and effective analgesia, to reduce the side effects and to to blunt the stress response. The opioid in the mixture act by inhibiting the release of substance P in the dorsal horn of the spinal cord ; local anaesthetics block the transmission of impulses at the level of the nerve axonal membrane.there is synergy of analgesic effect.

Commonly used local anaesthetic drug is bupivacaine

Opioids used are fenanyl,morphine,buprenorphine

Our study is a comparison of bupivacaine alone or along with buprenorphine when injected intrathecally for alleviating postoperative pain in elective cesarean section.

AIM OF STUDY

To compare the effectiveness of intrathecal 0.5%Heavy bupivacaine and Buprenorphine 60µg with 0.5%Heavy bupivacaine for postoperative analgesia in elective caesarean section.

METHODS OF PAIN MEASUREMENT

Pain is a personal, subjective experience that comprises sensory- discriminative, motivational- affective and cognitive – evaluative dimensions. Since pain is subjective, the patient's self report provides the most valid measure of the experience

The various measures of pain used are :

1. Visual Analogue scale
2. McGill pain Questionnaire
3. Descriptor differential scale
4. Verbal and Numerical Rating Scales

Visual Analogue Scale

The most common form consists of a scale with 10 cm horizontal line with two end-points labelled 'no pain' and 'worst pain ever'. The patient is required to place a mark on the 10 cm line at a point that corresponds to the level of pain intensity he currently feels.

Advantages

1. It has ratio scale properties.

2. It is minimally intrusive.

3. It is conceptually simple.

Disadvantages

1. Bias of expectancy for change and reliance on memory.

2. Assumption that pain is a uni – dimensional experience.

METHODS OF POST-OPERATIVE PAIN RELIEF

1. Opiates

a) intramuscular

b) continuous/intermittent intravenous

c) Patient controlled Analgesia(PCA)

d) Intrathecal

e) epidural

f) Others – oral, sublingual, Transdermal,Rectal

2. Non-narcotic:

Invasive:

a) Regional Anaesthesia

b) Local anaesthetic infiltration

c) Cryoanalgesia

d) Continuous interpleural infusion

e) **Non-invasive**:

a) Inhalational

b) Transcutaneous Electrical Nerve Stimulation (TENS)

c) Hypnosis

d) Acupuncture

e) Relaxational technique.

ANATOMY

The bony spinal canal extends from foramen magnum to sacral hiatus. It is formed by the vertebral border inferiorly, pedicles by laterally and by laminae and spines posteriorly. Through the intervertebral foramina segmental nerves and blood vessels passes.

Contents:

1. Spinal nerve roots
2. CSF ,membranes and spinal cord
3. Venous plexus and alveolar tissue of extradural spaces

SPINAL CORD

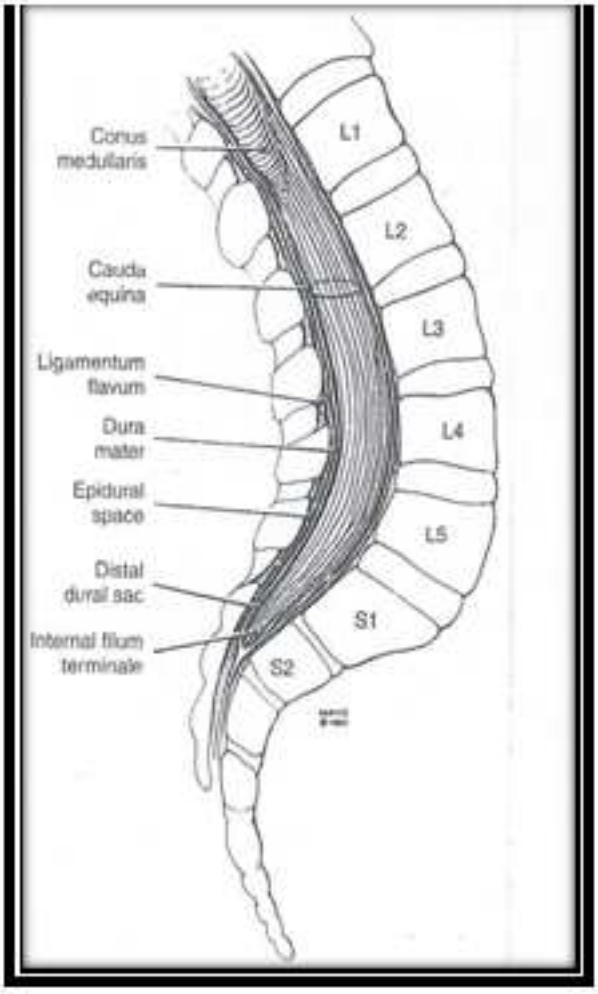
- An elongated cylindrical mass of nervous tissue.

- Length 42-45cm, weight – 30gm

- Occupies upper 2/3rd of vertebral canal

- Extends from atlas to L1 or L2 vertebra

- The anterior and posterior roots of the most caudal nerves emerge from the conical terminus of the spinal cord.



- Conus medullaris form bundle of nerves reffered as cauda equina upto S2 level

- Pia mater continues caudally from conus medullaris terminale Spinal nerves emerge in pair from the cord – 8 cervical, 12 thoracic, 5 lumbar, 5 sacral and one pair of coccygeal nerve. Anterior and posterior nerve roots cross the extradural space and ii the intervertebral foramina unite to form trunk which immediately divide into anterior and posterior primary division and mixed nerve.Nerve roots have no dural sheath in the dura mater, so the anaesthetic drugs easily diffuse into them.

CURVES OF THE SPINE

Cervical curve – convexity anterior

Dorsal curve - convexity posterior

Lumbar curve - convexity anterior

Sacrococcygeal –convexity posterior

High point of spinal curve – L3

Low point - T5

Blood supply :

Blood supply to spinal cord is derived from a single anterior spinal artery and two posterior spinal arteries.

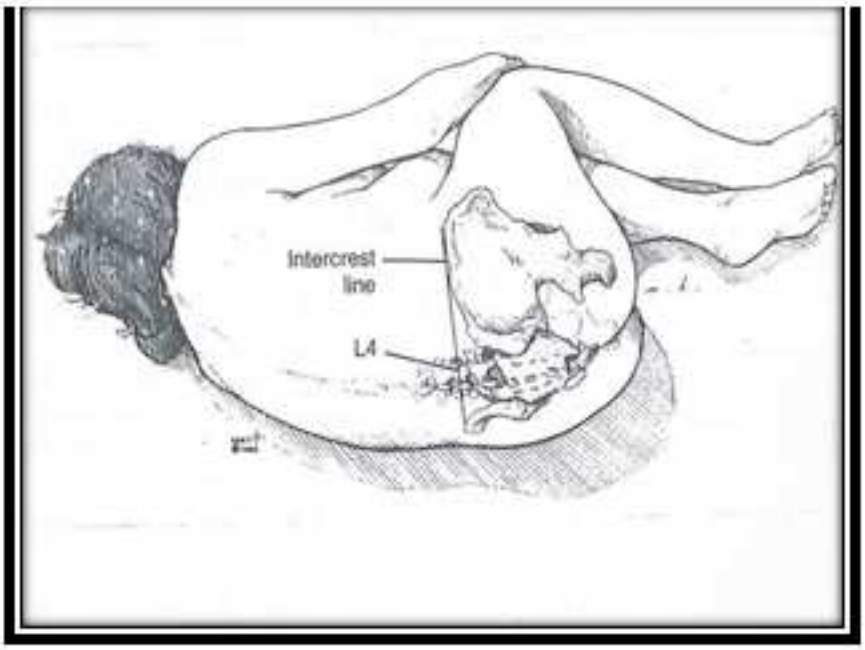
The anterior spinal artery is formed from vertebral artery at base of the skull and course down along the anterior surface of the cord. It supplies the anterior two-thirds of the cord, whereas posterior spinal arteries supply the posterior one-third.

The posterior spinal arteries arise from the posterior inferior cerebellar arteries and course down along the dorsal surface of the cord medial to the dorsal nerve roots.

Anatomical changes of pregnancy

The enlarged epidural veins may displace CSF from the thoracolumbar region of the subarachnoid space. This displacement partly explains the lowered dose requirement for spinal anaesthesia in pregnant women.

Sub arachnoid dose requirement are also affected by low specific gravity of CSF in pregnant patients.



A pregnant women's pelvis rotates on the long axis of the spinal column ; thus , the line joining the iliac crest assumes a more cephalad relationship to the vertebral column.

There is less space between adjacent lumbar spinous process during pregnancy. And the apex of lumbar lordosis is shifted caudad during pregnancy and the typical thoracic kyphosis in women is reduced in pregnancy.

Sub-arachnoid space :

Sub arachnoid space is located between the pia and arachnoid mater. It includes the following structures : (i) CSF, (ii) spinal nerves (iii) a trabecular network between the membranes, (iv) blood vessels that supply the cord (v) lateral extension of the pia mater – dentate ligaments –these ligaments give lateral support from the spinal cord to the pia mater.

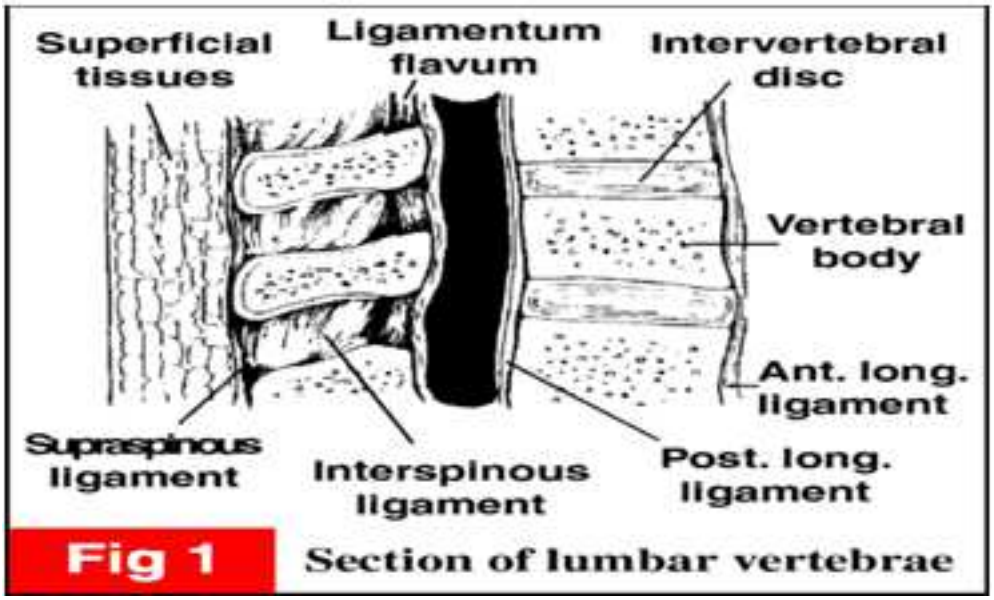


Fig 1 Section of lumbar vertebrae

SPINAL ANAESTHESIA

Definition:

Spinal anaesthesia is a form of regional anaesthesia obtained by blocking the spinal nerves in the sub arachnoid space by injecting local anaesthetic solution in to CSF, which mainly act on the spinal nerve roots.

HISTORY:

1885 - J.C corning administered cocaine intrathecally for pain

1891 - Heinrich Irenaeus Quincke demonstrated technique of lumbar puncture in diagnosis

1898 – august Bier of Germany produced true spinal anaesthesia in man

1900 – Rudalph matas pioneer in spinal opioids

1905 – Pitkin popularized the method of introducing agents intrathecally.

1908 – Baker described the use of dextrose to increase, alcohol to decrease the density of local anaesthetic solution

Sites of action in order of importance are

1. Primarily on the spinal cord nerve roots.
2. Secondarily act on dorsal root ganglia and postero anterior horn synapse.

Susceptibility of nerve fibre depends on

1. Fibre size
2. Degree of myelinisation and distance between the nodes of ranvier.
3. Frequency of nerve impulse transmission

Order of nerve block

1. Autonomic preganglionic b fibres
2. Temperature – cold then warmth is lost.
3. Temperature discrimination is lost
4. Slow pain followed by fast pain
5. Tactile sense
6. Motor blockade – extensors then flexors
7. Pressure sense lost
8. Proprioception lost.

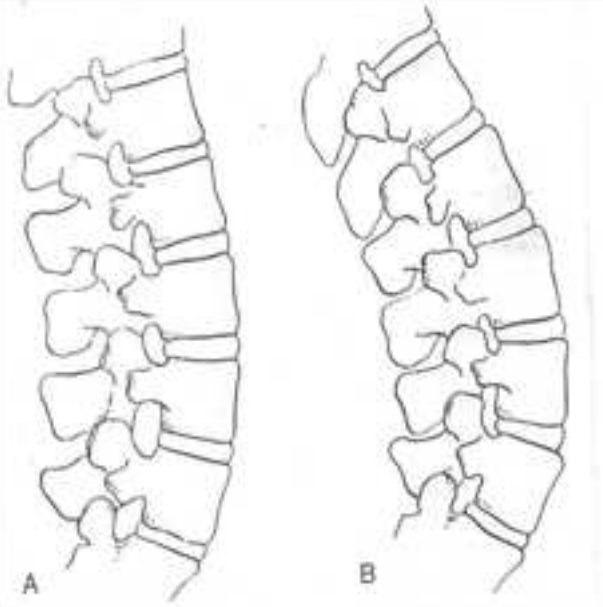


FIGURE 2-9 Effects of pregnancy on the lumbar spine. **A**, Nonpregnant. **B**, Pregnant. There is a marked increase in lumbar lordosis and a narrowing of the interspinous spaces during pregnancy. (Modified from Bonica JJ. Principles and Practice of Obstetric Analgesia and Anesthesia. Volume 1. Philadelphia, FA Davis Company, 1967:35.)

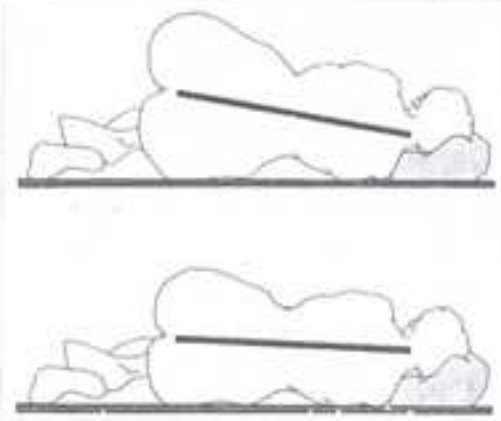


FIGURE 2-10 Pelvic widening and resultant head-down tilt in the lateral position during pregnancy. *Upper panel*, pregnant; *lower panel*, nonpregnant. (Modified from Camann WR, Ostheimer GW. Physiological adaptations during pregnancy. Int Anesthesiol Clin 1990; 28:2-10.)

NEURAXIAL ANAESTHESIA: ANAESTHETIC IMPLICATIONS

Technical consideration :

Enhancement of lumbar lordosis results in reduced vertebral interspinous gap , creating technical difficulty

Widening of the pelvis results in a head-down tilt when pregnant

women in lateral position- may increase rostral spread of local anaesthetic solution.

Anaesthetic dose requirements :

Pregnant women exhibit a more rapid onset and a longer duration of spinal anaesthesia than nonpregnant due to enhanced neural sensitivity to local anaesthetics. Elevation in CSF pH may also contribute to this effects.

The dose of hyperbaric local anaesthetic required in term pregnant is 25% lower than in nonpregnant is due to

i) reduction of the spinal CSF volume, which accompanies distention of vertebral venous plexus;
ii) enhanced neural susceptibility to local anaesthetics;
iii) increased rostral spread, caused by the widening of the pelvis;
iv) inward displacement of intervertebral foraminal tissue, resulting from increased abdominal pressure;
v) a higher level of the apex of the thoracic kyphosis during late pregnancy.

NEUROPHYSIOLOGY OF PAIN

Mechanism of pain

To deal intelligently with problems of pain , it requires great deal of familiarity with anatomy of sensory pathways sensory supply of body segments and insight into the psychological factors that influence behaviour and knowledge of medical and psychiatric diseases.

PAIN THEORIES

During nineteenth century many studies were undertaken that prompted the explicit formulation of two physiologic theories of pain the specificity theory and the intensive theory. The specificity theory of Von Frey stated that pain was a specific sensation with its own sensory apparatus, independent of touch and other senses.

The intensive (summation) theory of Goldscheider in 1894 states that stimulus intensity and central summation were the critical determinants of pain.

Later, pattern theories by Nafe in 1934 suggested that all cutaneous qualities are produced by spatial and temporal patterns of nerve impulses.

Later in 1943, Livingston proposed his central summation theory.

FOURTH THEORY OF PAIN

Hardy,Wolff and Goodell in 1940 introduced the concept of duality of pain. Pain can be separated into two components- perception of pain and reaction of pain. This concept assumes a one to one relationship between the intensity of stimulus and pain perception and relegates the reaction to pain as secondary response.

SENSORY INTERACTION THEORY

Noordenbos in 1959 stated that large fibers inhibit and small fibers excite central transmission neurons, which project to a multi synaptic system that leads to the brain.

GATE CONTROL THEORY

In 1965 Melzack and Wall propounded their gate control theory taking into account, the evidence of physiologic specialisation , central summation, patterning, modulation of input and the influence of psychological factors.

They observed in decerebrate and spinal cats that peripheral stimulation of large myelinated fibers produced a negative dorsal root potential and stimulation of small **c** fibers caused a positive dorsal root potential.

They postulated that these potentials which were a reflection of presynaptic inhibition or excitation modulated the activity of secondary transmitting neurons

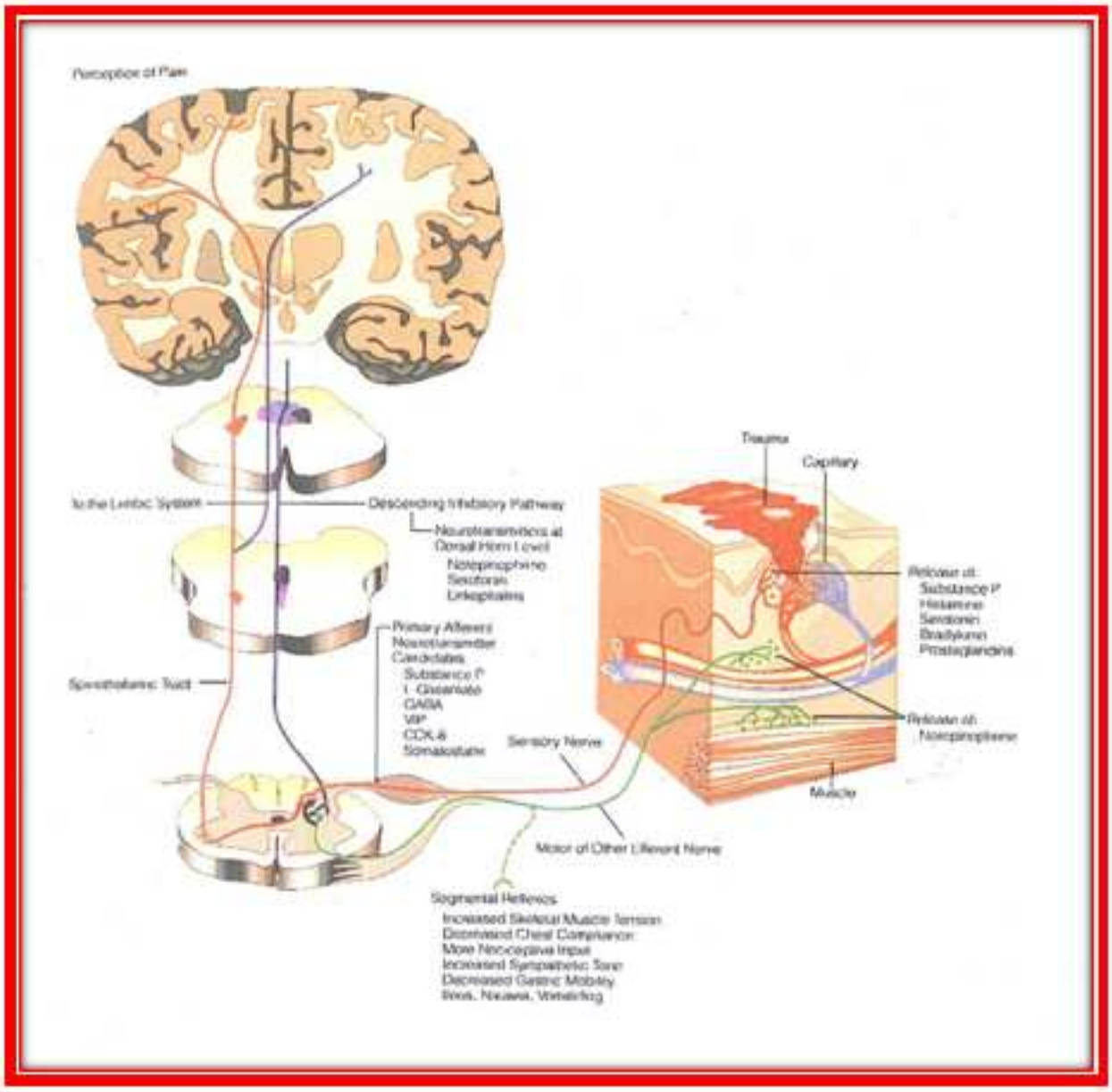
(Tcells) in the dorsal horn and that this modulation was mediated through an inhibitory neurons (I cells) in the substantia gelatinosa of Rolando.

Later refinement of the gate control hypothesis, Wall placed the T cells in lamina V of the dorsal Horn and still unidentified inhibition cells in the Lamina II and III. The essence of this theory is that large diameter fibers excite the I cells which then cause a presynaptic inhibition of the T cells. The small pain afferents inhibit the I cells leaving the T cells in an excitatory state. The gate comes under central control through the dorsal column and whos cell bodies lie in the medullary raphe nuclei, which may also inhibit pain transmission, presumably by action on the internuncial neuron.

Pathways of pain

Pain receptors in the skin and other tissues consists of un-myelinated free nerve endings, activated by high intensity stimuli which may be thermal, mechanical, electrical or chemical.

A delta fibers are finely myelinated and rapidly conducting 12-30m/sec. They conduct the sharp pain produced by pin prick, electrical or thermal stimuli and are responsible for withdrawal reflexes. A delta conducted pain is felt quickly and is well localized.



C fibers are very fine non myelinated which conduct at a slow rate of 2-3 m/sec or less. Their threshold for stimulation is higher than that of A delta fibers and they are responsible for more delayed and truly noxious burning or throbbing pain.

Peripheral sensory nerves have their cell bodies in the dorsal root ganglion and the actual projections of Aδ and c fiber neurons enter the dorsal horn in the lateral division for the dorsal root.

In the Gray matter of the spinal cord cell bodies are arranged in a series of laminae which are given ROMAN NUMERALS with I at tipoff the dorsal horn.

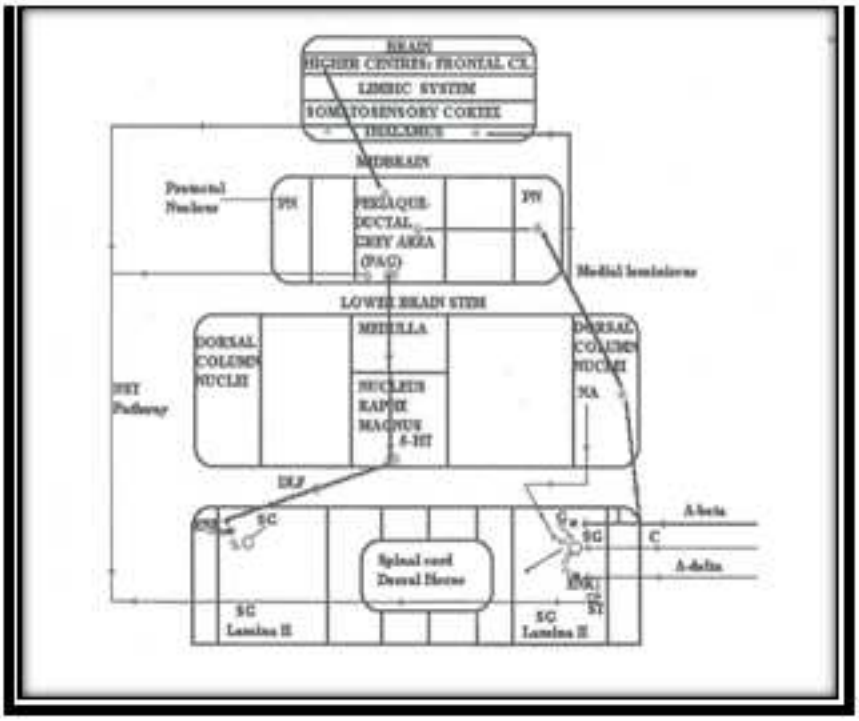
Aδ and c primary afferent fibres terminated principally in the marginal layer Lamina I and Substantia gelatinosa II. Some of the neurons of the Lamina I which synapse with the Aδ fibres give off axons which ascend in the contralateral anterior column without synapsing with neurons in deeper layers. Majority of pain fibres however synapse in the substantia gelatinosa with intermediate neurons which send projections to deeper layers or with dendrites of neurons whose cell bodies reside in deeper layers principally lamina.

Central projection from cell bodies in lamina IV,V,VI with contribution from Lamina I cross midline in the anterior commissure to form the ventral spinothalamic tract which ends in the thalamus, principally in the ventro posterior nucleus, sending few fibers, enroute to the periaqueductal grey matter. The ventroposterior nucleusof the thalamus projects to the post central gyrus(sensory cortex) where anatomical representation is reasonably precise

Pain stimuli can also pass via interneuron to cell bodies in the intermediate grey matter (lamina VII & VII) who's central projection also ascend in the contralateral anterolateral column forming spino reticular pathway. They pass via reticular formation to be relayed non-specifically over a wide and poorly localized area of cerebral cortex.

Endogenous pain control mechanism:

An endogenous analgesia system was first demonstrated by Reynolds (1969) found that stimulation of the ventrolateral periaqueductal grey matter, in the rat, produced a profound analgesia without altering behaviour or motor activity. Diencephalons and rostral bulbar nuclei (Raaphe magnus and paragigantocellularis) have similar effect.



Physiology of pain

Pain has been transmitted through four distinct processes 1.**Transduction**: noxious stimuli converted into electrical signal by peripheral afferents.

2.**Transmission** : electrical signal is propagated along nociceptive pathways.

3.**Modulation** : Nociceptive signal is altered within the dorsal horn.

4**. Perception** : Integration of nociceptive input with emotional and cognitive factors to create subjective pain.

OPIOID RECEPTORS

From time immemorial opiates have been the best analgesics that man has ever known. The advancement in basic sciences has helped us to unravel the inbuilt endogenous opiate system. The narcotic analgesics drugs mitigate the responsiveness of human and animals to painful stimuli without affecting the other sensory modalities.

ENDOGENOUS OPIATE SYSTEM

It originates in the brain stem and modulates pain by exerting a descending influence at the first synapse for pain transmission in the spinal cord dorsal horn and the trigeminal nucleus caudalis through the opioid peptides.

Two different opioid peptide systems present in the CNS. The first is the small peptides methionine-encephalin and leucine-encephalin ,spread unevenly throughout the brain,spinal cord and peripheral nervous system. The second is the larger β-endorphin ,extending from the hypothalamic pituitary axis into the midline regions of the diencephalon and anterior pons.

Distribution

The opioid peptides exist in all vertebrates and many invertebrate species. The highest concentration is seen in pituitary gland. It is also seen in medial basal and arcuate region of the hypothalamus.

The large peptide β-endorphin is found in the small intestine , placenta and plasma, but its exact role in spinal cord is doubtful.

Enkephalin is distributed in amygdala, globus pallidus, striatum, hypothalamus, brainstem spinalcord dorsal laminae I, II,V of CNS. They are also present in the peripheral nervous system (peripheral ganglia, autonomic nervous system) adrenal medulla, GIT and plasma. Dynorphin, though found in the hypothalamo neurohypophyseal axis, its importance is unclear.

β-endorphin acts on epsilon receptor and has no role in analgesia but modulates nociception during stress.

Enkephalins acts as inhibitory neurotransmitters and elicit analgesia through the release of substance P in the dorsal horn. They also mediate acupuncture analgesia. Dynorphin has a nociception control at spinal level, through kappa receptor activation, than in the brain. The other roles for endogenous opioids are μ mediated antidiuresis and κ activated free water diuresis.

EXOGENOUS OPIOIDS AND OPIOID RECEPTORS

In 1976,Martin and coworkers proposed three classes of opiates based on the studies on chronic spinal dogs and named them according to prototype drugs.

μ - Morphine

κ – Ketocyclazocine

σ – (SKF10,047)

Kosteshitz classification added delta receptor with affinity for leu enkephalins and a fifth receptor the epsilon receptor with a high affinity for β endorphin.

Significant achievements

1971	Demonstration of existence of opioid receptors by radioligand by **Goldstein A** et al.
1973	Demonstration of opioid receptors in brain by Pert C.B. and Snyder S.H.

1976 Demonstration of opioid receptors in spinal cord byLamotte .C. Pert C.B. et al.

1976 Demonstration of analgesia in animals by spinal opioids by Laksh T.L. and Rudy T.A.

1979 Intrathecal opiates first used in man by Wang et al.

Mu receptors:

μ receptors are major antinociceptor site located in the brain and spinal cord with high concentration in the periaqueductal grey matter and substantia gelatinosa . Morphine is a typical agonist, and it mediate supraspinal analgesia, respiratory depression, euphoria and physical dependence.

Mu1- high affinity- mediate analgesia

Mu2- low affinity –no analgesia ;respiratory depression.

Kappa receptors:

Ketocyclazocine and ethyl ketocyclazocine – agonists.Have greater effect on spinal nociceptive responses than supraspinal. Associated with sedation and miosis

Sigma receptor:

Associated with pshycomimetic action of many opioid derivatives. Associated with mydriasis, tachycardia and mania. Typical agonist is N allyl norcyclazocine.

Delta receptor:

Stable encephalin analogue D Aladien Enkephalin(DADL) has greater activity than Mu agonist.

Epsilon receptor:

Beta endorphins block electrical stimulation at this receptor, a stable peptide with opioid activity, present mainly in the pituitary

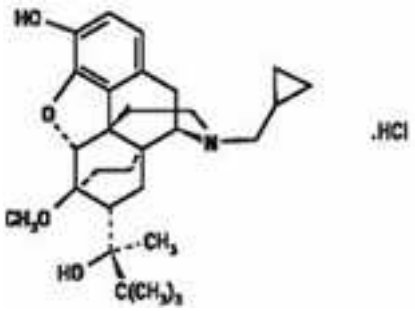
CHARACTERISTICS OF OPIOID RECEPTORS

Receptors	Major Action
Mu (μ) **Mu1 (μ1)** **Mu (μ2)**	 **Analgesia** **Bradycardia** **Sedation** **Respiratory depression Euphoria** **Physical dependence**
Delta (δ) **Kappa (κ)**	**Analgesia (weak) Respiratory depression** **Analgesia(weak)** **Respiratory depression** **sedation**
Sigma (σ)	**Dysphoria/delirium/mydriasis** **Hallucinations** **Tachycardia**
Epsilon (ϵ)	**Hypertension** **Stress response** **Acupuncture**

PHARMACOLOGY OF BUPRENORPHINE

Buprenorphine is a semi synthetic highly lipophilic opioid derived from thebaine, an opium alkaloid related to morphine , and is a long acting analgesic with narcotic agonist and antagonist action. It is a white powder, weakly acidic and with limited solubility in water.

Structural formula



Buprenorphine HCl chemically is 17(cycloprophylmethyl) α (1,1 dimethyl ethyl) -4-5 epoxy -18-19 dihydro-3 hydroxy 6 methoxy αmethyl- 6, 14 –ethano – morphinan -7-methanol,hydrochloride(5,7(s)). It has a molecular formula C29H41NO4 HCl.

Molecular weight =504.09

Mechanism of Action

Buprenorphine appears to have a high affinity for both μ and κ receptors low to moderate intrinsic activity at μ and κ receptors, in contrast the drug appears to have low to high affinity for and low intrinsic activity at δ receptors. Buprenorphine binds slowly with and dissociates slowly from the μ receptors.(this may account for the prolonged duration of analgesia)

Clinical pharmacology

Buprenorphine is an opiate analgesic 33 times more potent than morphine . Onset of action is slow and peak effect does not occur until 3hours. Duration of action <10hours.

Buprenorphine is metabolised in the liver and clearance is related to hepatic blood flow.

Effect on the CNS:

Buprenorphine produces analgesia, sedation miosis and a lesser degree of nausea and vomiting which is exacerbated by movements. It may produce side effects like dizziness , sweating and headache

Hemodynamic Effects of Agonist-Antagonist Compounds Compared with Morphine

Drug	Cardiac Workload	Blood Pressure	Heart Rate	Pulmonary Artery Pressure
Morphine	↓	↓	=↓	=↓
Buprenorphine	↓	↓	↓	?
Butorphanol	↑	=↑	=	↑
Nalbuphine	↓	=	=↓	=
Pentazocine	↑	↑	↑	↑

RESPIRATORY SYSTEM:

Buprenorphine depresses the respiratory centre and decreases both tidal volume and rate of respiration. It decreases minute ventilation at doses higher than 3µg/kg, maximal respiratory depression observed 3hours later. Respiratory depression can be prevented by prior administraton of naloxone,but they are not readily reversed once the effects have been produced.

Pharmacokinetics:

Absorption :

Buprenorphine is relatively well absorbed by most routes;including sublingual route 0.2 to 0.8mg produce satisfactory analgesia.

High lipophilic substance and well absorbed across biological membranes.High hepatic clearance, sublingual administration enters directly

Protein binding:

Highly protein bound primarily to α and β globulin fraction(96%). Volume of distribution is 2.8L/Kg.

METABOLISM:

Buprenorphine is metabolised in liver by N-dealkylation and glucuronide conjugation and the metabolites are – Buprenorphine 3 glucuronide and Norbuprenorphine and have lower affinity for μ receptors.

Metabolites are excreted through bile in the faeces, smaller amount appears in the urine.

Clearance rate : 20ml/Kg/min.

Preparation,Route of administration and Doses :

It is available as Buprenorphine hydrochloride. It is a clear, sterile solution for IV and IM administration and each ml contains 0.324mg hydrochloride (equivalent to 0.3mg Buprenorphine) 50mg anhydrous dextrose, water and HCl to adjust pH.

Preservative free Buprenorphine available as 0.3mg/ml also available. Also available as sublingual tablets 0.2 to 0.4mg.

Therapeutic uses :

1. As a premedicant
2. As an analgesic in balanced N2O/O2 relaxant technique.
3. In post-operative analgesia
4. In acute pain of moderate to severe degree and chronic pain

5. Sublingual Buprenorphine in preventing recurrence of pain following MI
6. As in Neuraxial blockade for intra and post-operative pain relief.

Precautions:

1. To be used with caution in patients with compromised respiratory function (eg. COPD, corpulmonale, hypoxia , hypercapnia) or patients given other respiratory depressant drugs.
2. To be used with caution in head injury, intracranial lesion and in circumstances where CSF pressure may be increased.
3. Patients receiving other narcotics, phenothiazines, other tranquilizers, sedatives, hypnotics or other CNS depressants with Buprenorphine may exhibit an additive CNS depression.
4. Should be cautiously used in elderly patients/ debilitated and those with severe hepatic , renal and pulmonary impairment.
5. In myxoedema or hypothyroidism, adrenocortical suppression,CNS depression, coma, toxic psychosis, acute alcoholism and delirium tremens it may be used with caution.

Tolerance and physical dependence:

Extensive investigations in a variety of animal species and models have identified a very low physical dependence liability. This has been confirmed in

human volunteer studies (Jasinski D.B Pevink and Griffiths 1978) following naloxone challenge and abrupt withdrawl after high dose chronic administration by a subcutaneous route. It is considered to be a low addictive potential .

Drug interactions:

Care should be taken when Buprenorphine is used in combination with CNS depressant drugs and MAO inhibitors.

Pregnancy :

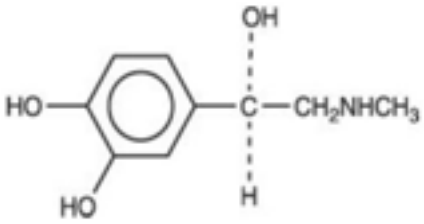
No major fetal malformation was noted when administrated by IM or IV routes.

PHARMACOLOGY OF BUPIVACAINE

Bupivacaine is an aminoacyl amide synthetic local anaesthetic, which has been synthesised at AB Bofors by **AF EKENSTAM** et al.,(1957). Clinically used by Telivuoin in 1963. It is produced for clinical use as a racemic mixture of the enantiomers containing equal proportions of the 'S' and 'R' forms.

Physicochemical Properties

Bupivacaine has long been a butyl group on the piperidine nitrogen atom of the molecule. It is a long acting local anaesthetic drug with high anaesthetic potency. It is more lipid soluble, highly protein bound and has greater intrinsic potency.It is 3-4 times as potent as lignocaine. It crosses the placenta and the blood-brain barrier.



1. Molecular weight base - 288

2. pKa- 8.1

3. Partition coefficient- 346

4. Mean uptake ratio- 3.3

5. Protein Binding- 96%

6. F/M ratio- 0.2 to 0.4

Pharmacological Properties

Onset - moderate

Relative potency - 8

Duration - Long

Mechanism of action:

Bupivacaine produces its effects by dual action on sodium conductance. 1. Acts directly on the receptors within the sodium channels.

2. Produces nonspecific membrane expansion

Pharmacological effects

a) Local : nerve blockade

b) Regional : Pain, temperature, touch, motor power and

vasomotor tone in the region supplied by the nerves are blocked.

C) Systemic : Effects occurring as a result of systemic absorption or intravenous administration.

On the cardiovascular system, the effect of bupivacaine is dose related. It depresses the automaticity of the heart and myocardial contractility. Depending on the membrane potential and the rate of stimulation, bupivacaine depresses Vmax considerably more than lignocaine and results in slowed conductance of the cardiac action potential which is manifest by prolongation of PR interval and QRS duration on the electrocardiogram. This results in re-entrant phenomena and ventricular arrhythmias. The sodium channels are blocked in a “fast-in, slow out” manner which causes difficulty in resuscitation when ventricular fibrillation has occurred. The cardiotoxicity of bupivacaine results from high lipid solubility and the R-enantiomer is more toxic than S-enantiomer. Bupivacaine produced more severe arrhythmias and the development of ECG disturbances and severe myocardial depression was more rapid .

Pharmacokinetics:

Volume of distribution at steady state(Vdss) - 73 litres

Terminal elimination half life - 210 minutes

Clearance - 0.58 litres/min

Plasma protein binding - 96%

Metabolism - in Liver bydealkylation to pipecolyloxlidide

Excretion - kidney – 5% as unchanged drug and rest as metabolites

PREPARATION AVAILABLE 0.125% , 0.25% , 0.5%

Maximal dose is **2mg/kg.**

Pregnancy may affect the metabolism of bupivacaine. Pregnant women may have higher concentration of PPX concentration, but the unconjugated 4-hydroxy metabolite is not produced in significant amounts due to the effectsof hormonal changes on hepatic enzyme systems. Both Progesterone and estradiol are competitive inhibitors of microsomal oxidases, whereas reductive enzymes are induced by Progesterone.

Bupivacaine is bound extensively to AAG and albumin. This protein binding is reduced during late pregnancy in humans.

ASSESSMENT OF THE NEWBORN

Apgar score

In 1953, Dr. Virginia Apgar, an anaesthesiologist, described a simple method for the assessment of the newborn that could be performed while care was being delivered. She developed this system to provide a standardized and relatively objective method of assessing the newborn's clinical status.

The Apgar score is based on five parameters that are assessed at 1minute and 5minutes after birth. Further scoring at 5- or 10-minutes intervals may be done if initial scores are low.

Score of 8 to 10 = normal

Score of 4 to 7 = moderate impairment

Score of 0 to 3 = need for immediate resuscitation

The 5 minute of apgar score was a better predictor of neonatal death than the umbilical arterial blood pH.

Apgar scores can be low for a variety of reasons. Preterm delivery, congenital anomalies, neuromuscular diseases, antenatal drug exposure , manipulation at delivery and subjectivity and error may influence the Apgar score.

Parameters	Score		
	0	1	2
Heart rate	Absent	<100	>100
Respiratory effort	Absent	Irregular, slow , shallow or gasping	Robust, crying
Muscle tone	Absent, limp	Some flexion of extremities	Active movement
Reflex irritability	No response	Grimace	Active coughing and sneezing
Colour	Cyanotic	Acrocyanotic	Pink

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Extracted from the POPPY, the opium alkaloid was named morphine after the Greek goddess of sleep, Morphina (also the Greek god of dreams, Morphews) in 1803 by Fredrich Meisuer.

1. Synder (1973) discovered the opiate receptors in the dorsal horn of spinal cord, the lower medulla and the floor of the fourth ventricle and initiated the idea that subarachnoid injection of opiates could provide good analgesia

2. Huges et al (1975), the discovery of enkephalins and complex endogenous opiod systems initiated the opiod receptor theory and study of pain mechanisms.

3. Yakash and Rudy studied the spinal action of morphine in animals, the pain relief was attributed to the spinal analgesia caused by direct action of narcotics on specific opiate receptors.

4. Kay B (1978), studied the double blind comparison of the effects of morphine 10 mg IV and buprenorphine 0.3 mg IV in the prevention of pain after operation. The drugs were given by the anaesthetist at the end of surgery and the onset and severity of pain were assessed by a trained nurse. He found that with buprenorphine the pain relief was far more than twice that of morphine. The only

side effect noticed was drowsiness. The incidence being greater after buprenorphine that after morphine

5. Wang et al (1979) reported the first use of intrathecal opiates in man. They studied 8 patients with intractable pain due to cancer of genito urinary tract with invasion of lumbosacral plexus. They injected 1 mg and 0.5 mg of morphine intrathecally and reported that the duration of pain relief ranged from 12-24 hours.

6. Cousins MJ and Glynn GJ (1979) reported the evidence of selective action of spinal narcotics. They found that 2 mg of Intrathecal morphine gave a pain relief of 24 hours after surgery. The absence of changes in sensory motor and sympathetic function indicates that this form of analgesia may have considerable advantage over other methods for the relief of severe chronic and acute pain in man.

7. Budd K. (1981) studied (IV) buprenorphine to produce analgesia in the immediate post operative period, the dose being titrated against the response of each patient in order to obtain complete freedom from pain. In 50 patients following LSCS under general anaesthesia, buprenorphine in the dose range 0.4 – 7.0 mg was found to be a potent, long lasting and safe analgesic. Serial blood gas estimations performed on ten of the patients confirmed the clinically observed lack of respiratory depression.

8. Watson and co-workers (1982), who found a longer duration of analgesia with buprenorphine 0.6 mg that 0.3 mg given IV after surgery. Analgesia and hormonal effects were greater with the greater dose without a parallel increase in respiratory depression.

9. Egan Lanz et al (1984), in their double blind study of post – operative analgesia, 158 patients who were given epidural analgesia with mepivacaine or bupivacaine with buprenorphine for orthopaedic surgery of lower extremities found that analgesia after 0.15 mg of Buprenorphine was superior to that after no injections for 6 hours after surgery. 0.3 mg of buprenorphine was superior both to no injections and to 0.15 mg of buprenorphine until 12th hour without any evidence of late respiratory depression. They concluded that epidural administration of 0.3 mg of Buprenorphine may be recommended for post operative analgesia following orthopaedic surgery of lower extremities.

10 . Green DW et al (1985), in a randomized double blind trail comparing morphine and buprenorphine and post operative analgesia combined with droperidol was conducted in 60 patients. Compared with morphine, taken as the standard analgesic, buprenorphine was shown to be a satisfactory analgesic for major surgery with no difference in incidence of unwanted effects.

11. Wolff J et al (1986), in a double blind controlled study, epidural buprenorphine 0.3 mg was compared with 4 mg of epidural morphine for post operative pain relief in the first 24 hours after major orthopaedic surgery. Duration of action was 620 minutes with buprenorphine with no side effects and 580 minutes with morphine with pruritis and urinary retention.

12. Lipp M et at (1987) in a double blind, randomized study of 29 patients who underwent orthopaedic procedures with the additional effect of intrathecal buprenorphine on isobaric spinal anaesthesia and post operative analgesia. The injections were 20 mg tetracaine (19 patients) or 20 mg tetracaine plus 0.15 mg buprenorphine (10) patients. After buprenorphine patients became aware of pain sensation 13 hours after injection; in the control group pain free intervals lasts only 9 hours. There was no alteration in blood pressure and pulse rate was slightly diminished with buprenorphine group.

13 . Capogna et al (1988), studied intrathecal 0.03 mg buprenorphine with bupivacaine 30 mg for post operative analgesia in the elderly patient showed prolonged analgesia with minimal disturbance of consciousness and comfortable breathing. The only side effects were nausea and vomiting in 11 and 14 patients respectively.

14. Calleno D et al (1989) spinal buprenorphine for post operative analgesia after ceasarian section. Group A (controls n = 15) received hyperbaric bupivacaine; group B and C received the same but with the addition of 0.03 mg or 0.045 mg buprenorphine, respectively. Patient receiving higher dose had longer effect of 420 minutes than lower dose of 173 minutes analgesia without any increase in side effects.

15. Sen M (1992) studied intrathecal buprenorphine for post operative analgesia in orthopaedic surgery. Intrathecally either hyperbaric bupivacaine 1 ml in group A (30 cases) or bupivacaine 1 ml and buprenorphine 300 micrograms in combination was given, only minimal disturbance of consciousness and respiration were observed. The only side effect of buprenorphine group was nausea and vomiting in 10 patients.

16. Nishimi et al (1994) studied the effect of intrathecal administration of opioid on minimum alveolar concentration and postoperative pain relief a comparison of morphine and buprenorphine showed:· Intrathecal administration of 0.05 mg and 0.075 mg of buprenorphine has shown analgesic effect without any side effects. With morphine 0.5 mg there was adequate post – operative analgesia with severe pruritus

17. Lundborg et al (1999), studied Intrathecal pain management for progressive systemic sclerosis with long term continuous intrathecal buprenorphine / bupivacaine concluded intrathecal infusion of buprenorphine / bupivacaine provided satisfactory long term pain relief in a patient with PSS associated raynauds phenomenon, skin ulceration and intractable ischaemic pain.

18.Sunil dixit et al., studied to compare intrathecal bupivacaine (0.5%) and buprenorphine ($60\mu g$) with bupivacaine (0.5%) for postoperative analgesia in caesarean section. Sixty parturient undergoing elective lower segment caesarean section (LACS) were randomly selected after dividing into two groups of 30 each. Control Group (C) received 1.70 ml (8.5mg) of bupivacaine (0.5%) while patients of study group (S) received 1.70 ml (8.5mg) bupivacaine 0.5%+($60\mu g$) buprenorphine. Onet of analgesia was 5.35±1.79 min in control group, while 1.85±1.39 min in study group ($P<0.001$). The total duration of analgesia was prolonged from 145.16±25.86 min in Control group to 491.26± 153.97 min in Study group.


L4
L5
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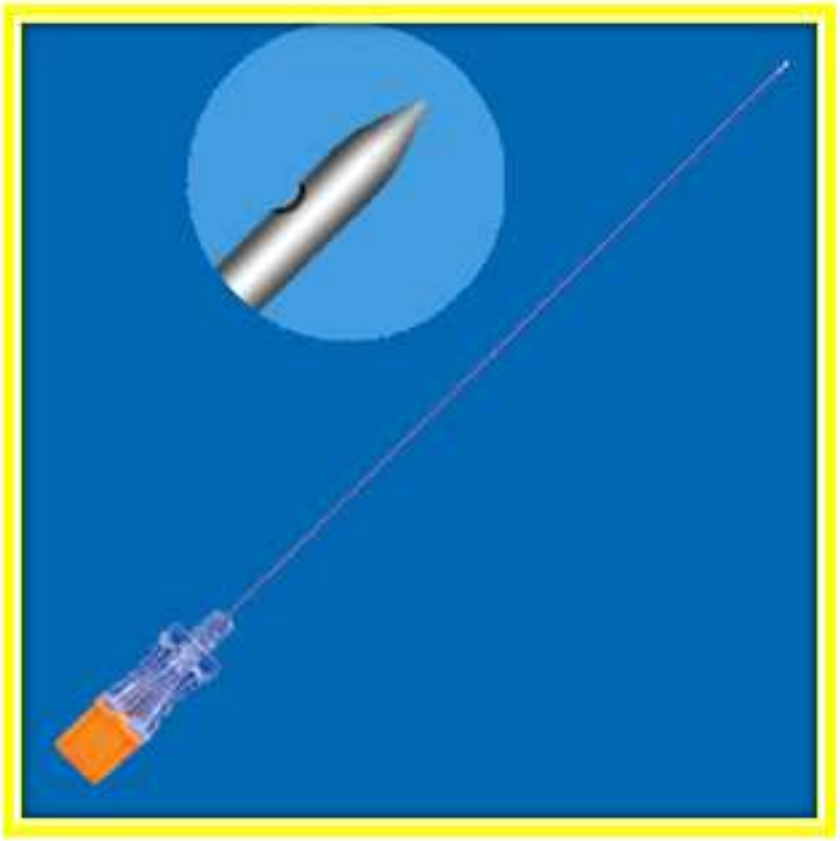


MATERIALS AND METHODS

MATERIALS AND METHODS

The study was conducted at Government Kasturba Gandhi hospital for women and children, Chennai-5, in 60 patients undergoing elective lower segment caesarean section.

Study design

Prospective, Randomised, double blind study.

Inclusion Criteria

age - 18 and above

ASA - I and II patients

BMI - <30 kg/m2

Elective lscs

informed consent

Exclusion criteria

not satisfying inclusion criteria

Patients posted for emergency surgery

Patients with bleeding diathesis

Patients with local sepsis

Platlet count < 1,00,000/µL

Eclampsia

Neurological deficits and Lack of written informed consent

Consent

The Institutional Ethical Committee approval and the patients' consent were obtained prior to the study.

Preoperative evaluation

All the patients who were included in the study had a clinical examinations of their cardiovascular and respiratory system. The investigations done included Haemoglobin, Bleeding time, Clotting time, Blood Urea and sugar, Urine albumin and sugar to rule out any systemic illness.

The fourty patients were randomized into two groups consisting of twenty each namely study Group A and Group B.

Group A : Received bupivacaine and buprenorphine

(n=20)

Group B : Received bupivacaine only (n=20)

explained about the procedure to the patients and obtained informed consent. Premedication inj.ondensetran 8mg, inj.ranitidine 50mg intravenously given 30mins before surgery. The height, weight and Vital signs were recorded on the day of surgery. Each patients were taught about the Visual Analogue Pain Scale and were asked to indicate her level of pain on a 10 cm long Visual Analogue Pain Scale. The patients were shown a 10cm long horizontal scale marked from 0-10 and were told that 0 represented absolutely no pain and 10 represented the worst pain they can imagine.

Basic monitoring like pulse oxymeter, ECG, NIBP connected to the patient. Baseline status consisting of the Visual Analogue Score, Pulse rate, systolic and diastolic blood pressure, respiratory rate, oxygen saturation were recorded on arrival at operation theatre. Preloaded with 20ml/kg of lactated Ringers solution , prior to sub-arachnoid block. Under strict sterile aseptic precaution,after local infiltration with 2% lignocaine, sub-arachnoid block was performed with 25G quincke type spinal needle, with patient in right lateral decubitus position at L3-L4 intervertebral space and hyperbaric 0.5% bupivacaine 1.7ml+ 0.2ml (60µg) of inj.buprenorphine in group A and 1.7ml of hyperbaric 0.5% bupivacaine + 0.9% normal saline 0.2ml in group B were given. Following subarachnoid block, the patient was immediately placed in supine position, to prevent aortocaval compression left uterine displacement was done by keeping a wedge under right

hip. O2 4L/min administered to all patients through simple face mask. Bladder catheterised routinely by surgeon.

Itraoperative hypotension was considered to be present , whenever systolic blood pressure decreased to less than 90mmHg or <20% of the baseline whichever appeared first and treated with ephedrine.bradycardia was to be treated with inj.atropine i.v0.02mg/kg ,if heart rate decresed to <60/min, and any fall in respiratory rate to less than ten per minute was noted.

The following parameters were assessed in the operation theatre

1. Pulse rate , blood pressure, Respiratory rate and oxygen saturation were monitored.

2. Dermatomal sensory blockade to pin prick was evaluated and maximum level of sensory block was noted.

3. Onset of sensory analgesia time noted.

4. Onset of motor blockade time noted.

5. Total duration of analgesia was recorded.

6. Pain was evaluated by **Visual Analogue Scale** devised by **Revill** and **Robinson** (1976). VAS 0 – 10 cm

0 – 2cm - No pain

2 – 4 cm - Mild pain

4 – 6 cm - Moderate pain

6 – 8 cm - Severe pain

8 – 10 cm - Worst pain

If the patient is asleep, it is taken as no pain. Time of first demand analgesia was noted.

7. Modified **bromage** scale for the onset on motor blockade

0	Free movement of legs and feet , with ability to raise extended leg.	None
1	Inabilty to raise extended leg and knee flexion is decreased but full flexion of feet and ankles is present	Partial 33%
2	Inability to raise leg or flex knees, flexion at ankle and feet present	Partial 66%
3	Inability to raise leg, flex knee or ankle or move toes	Complete paralysis

8. sedation score was noted intra-operatively and post-operatively

Ramsay sedation score

1 = Anxious , agitated and restlessness

2 = Oriented and cooperative

3 = Responds to command only

4 = Brisk response to loud voice and glabellar tap

5 = sluggish to NO response to light glabellar tap or loud auditory stimulus.

6 = No response to pain.

9. Apgar score at 1min and 5min of delivery of the baby

Total score of 8 to 10 = Normal

Score of 4 to 7 = moderate impairment

Score of 0 to 3 = needs immediate resuscitation.

After completion of surgery patient was shifted to High Depedency Unit for observation and monitored postoperatively for 24 hours.

The following parameters were observed post-operatively:

1. Pain assessment – VAS

2. Sedation

3. Pulse rate

4. Blood pressure

5. Respiratory rate

6. Oxygen saturation

7. Time of first demand analgesia- duration of analgesia

8. Side effects like post operative nausea, vomiting, pruritus, respiratory depression, hypotension, bradycardia, sedation

OBSERVATION AND RESULTS

OBSERVATION AND RESULTS

The study was conducted on a total of sixty patients to ASA I , II. They were divided into two groups of thirty each

Group A : received 0.2 ml of buprenorphine (60µg) with 0.5% hyperbaric bupivacaine 1.7ml

Group B : received 0.2 ml of Normal saline with 0.5% hyperbaricbupivacaine 1.7ml

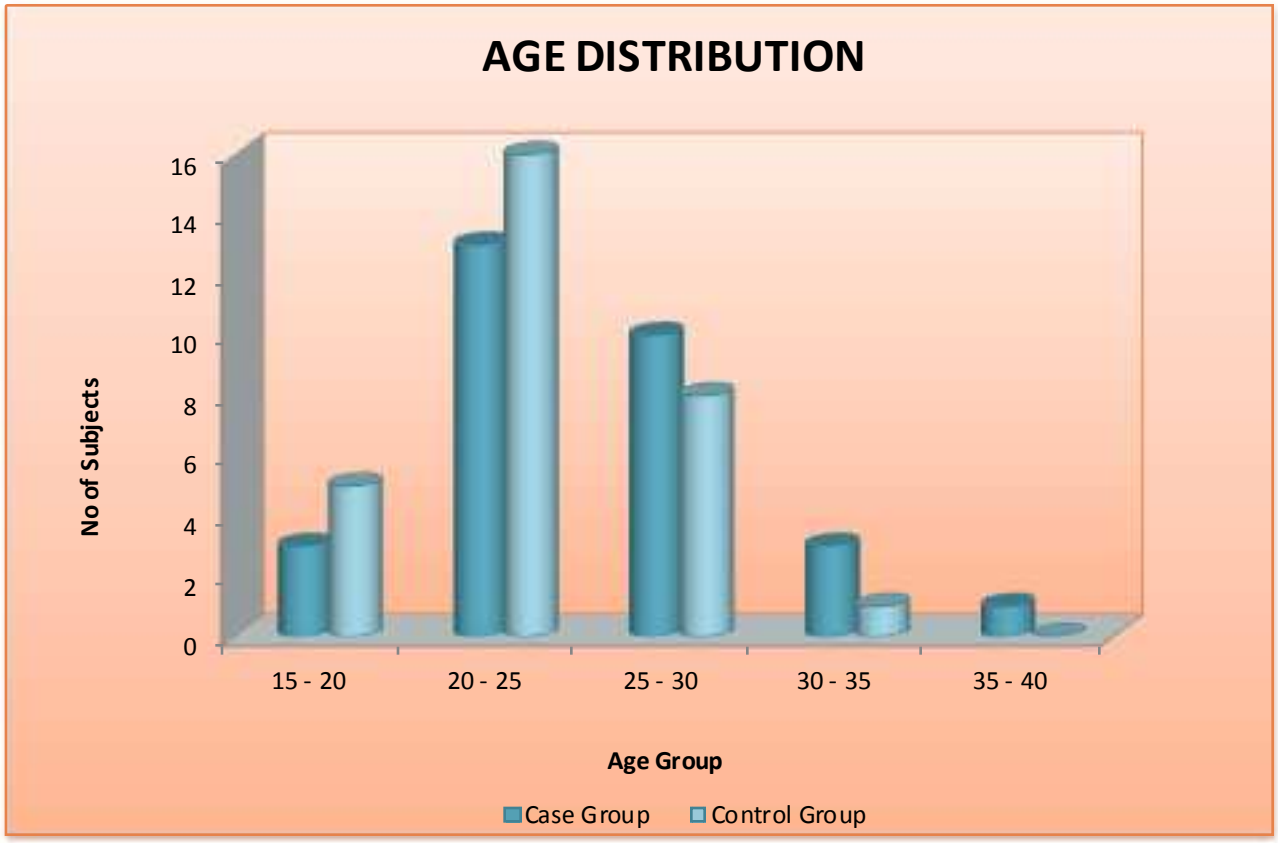
In both patients the volume of solution was kept constant

Table 1 - Age Distribution

Age	Case Group A		Control Group B		Total	
	Number	**Percentage**	**Number**	**Percentage**	**Number**	**Percentage**
15 – 20	03	10.00	05	16.70	08	13.30
20 – 25	13	43.30	16	53.30	29	48.30
25 – 30	10	33.30	08	26.70	18	30.00
30 – 35	03	10.00	01	03.30	04	06.70
35 – 40	01	03.30	-	-	01	01.70
Total	**30**	**100**	**30**	**100**	**30**	**100**

	Group-A	**Group-B**
Mean	25.57	24.73
Sd	4.51	3.53
t-value	**0.80**	
Df	**58**	
p-value	**0.43 (Not Significant)**	

The mean distribution of cases by age was observed and it shows statistically not significant in groups A and B.



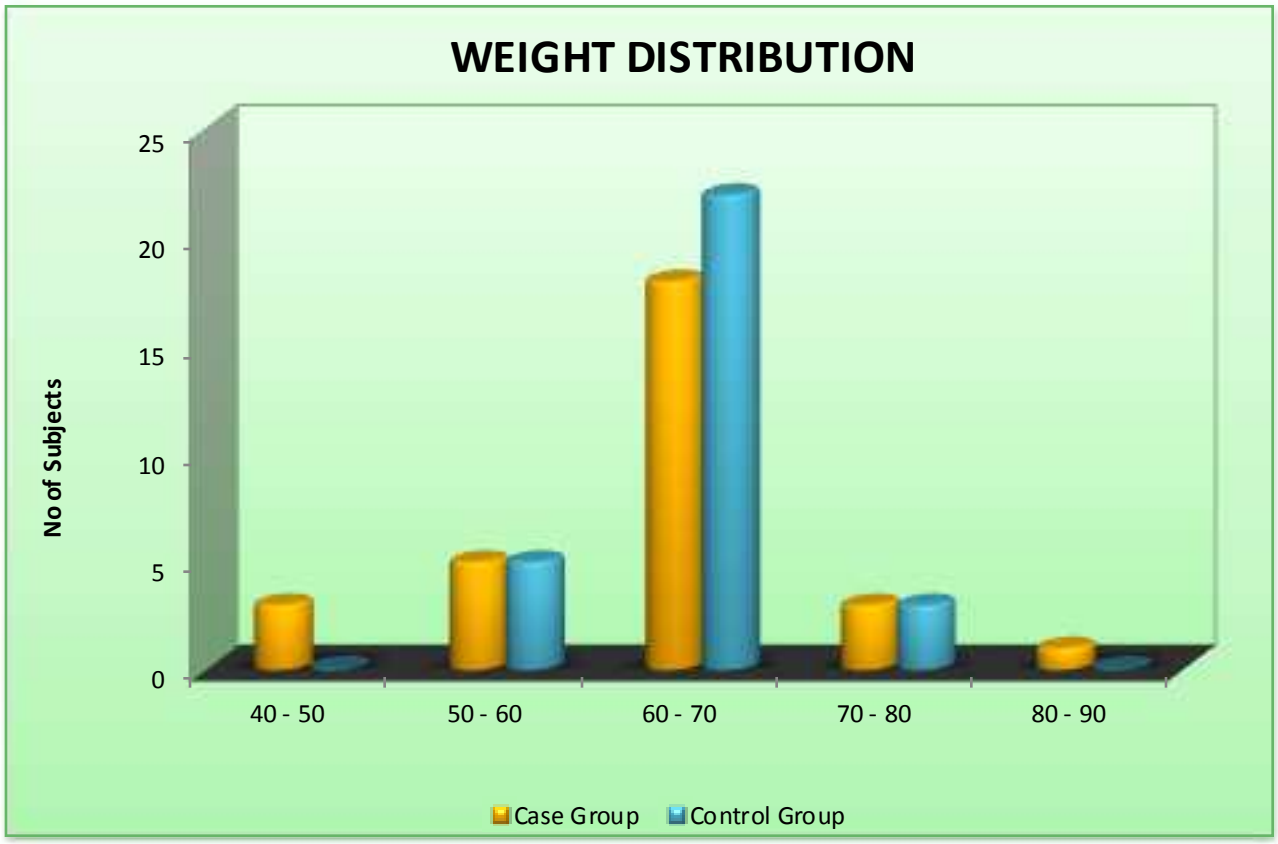


Table 2 - Weight Distribution

Weight	Case Group A		Control Group B	
	Number	Percentage	Number	Percentage
40 – 50	3	10.00	0	-
50 – 60	5	16.70	5	16.70
60 – 70	18	60.00	22	73.30
70 – 80	03	10.00	03	10.00
80 – 90	01	03.70	0	0
Total				

	Case Group A	Control Group B
Mean	64.57	65.90
Sd	8.40	4.74
t-value	**0.76**	
Df	**58**	
p-value	**0.45 (Not Significant)**	

The mean distribution of cases by weight was observed to be statistically not significant between the groups A and B.

Table 3 : Height Distribution

Height	Case Group		Control Group	
	Number	**Percentage**	**Number**	**Percentage**
140 – 145	02	06.70	-	-
145 – 150	01	03.30	02	06.70
150 – 155	11	36.70	11	36.70
155 – 160	15	50.00	15	50.00
160 – 165	01	03.30	02	06.70
Total	**30**	**100**	**30**	**100**

	Case Group	Control Group
Mean	154.97	155.93
Sd	4.36	3.41
t-value	**0.96**	

Df	**58**
p-value	**0.34 (Not Significant)**

The mean distribution of cases by height was observed to be statistically not significant between groups A and B

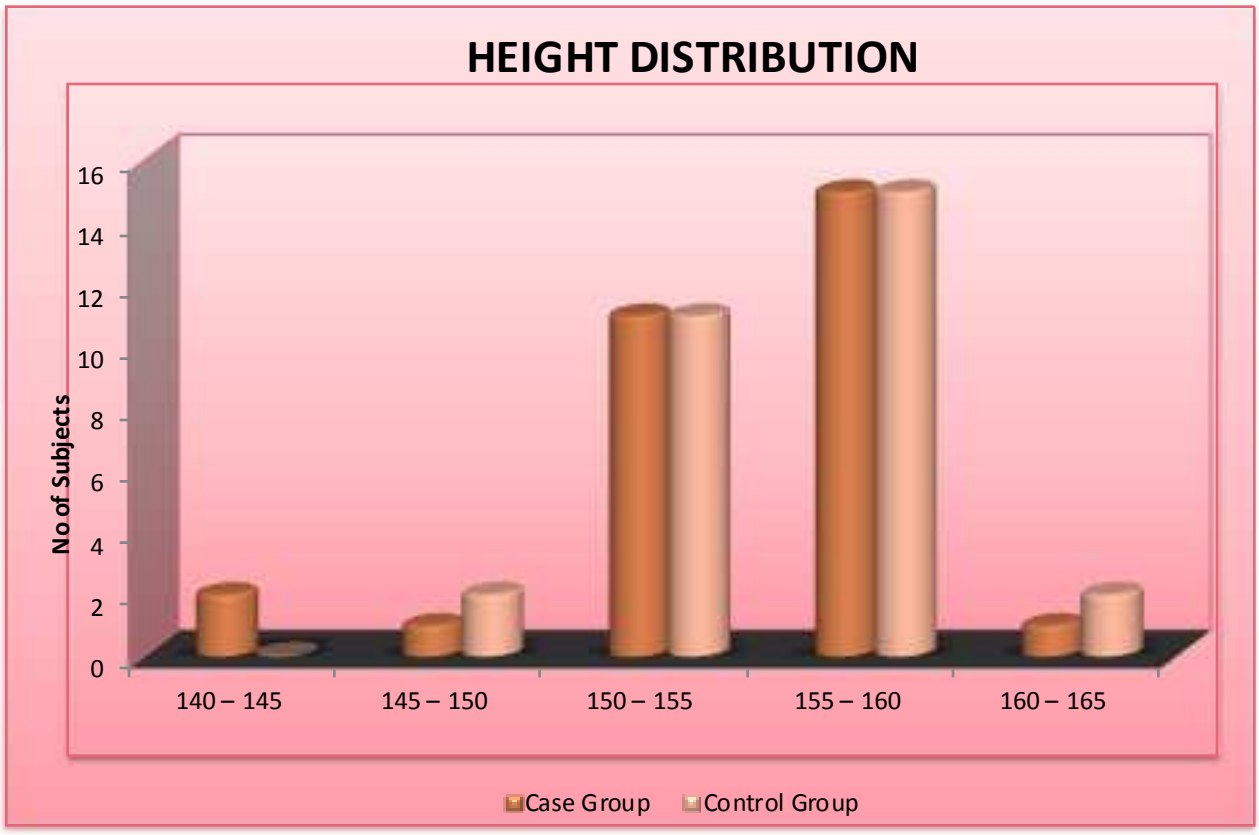


Table-4 Diagnosis

Diagnosis	Case Group		Control Group	
	Number	Percentage	Number	Percentage
Elderly primi	1	3.30	0	-
G2/mobile head	1	3.30	1	3.30
G2/Polyhydramnios	0	-	1	3.30
G2/twin pregnancy	1	3.30	0	-
G2P2/BREECH	2	6.70	0	-
previous lscs	11	36.70	17	56.70
previous lscs/anaemi	2	6.70	3	10.00
previous lscs/PIH	2	6.70	0	-
Primi	1	3.30	0	-
primi/bigbaby	0	-	1	3.30
primi/breech	2	6.70	0	-
primi/mobile head	3	10.00	2	6.70
primi/oligohydramnio	1	3.30	1	3.30
primi/PIH	1	3.30	4	13.30
primi/polyhydramnios	1	3.30	0	-
primi/short stature	1	3.30	0	-
	30	**100**	**30**	**100**

Table-5

ASA Status

ASA	Case Group		Control Group	
	Number	Percentage	Number	Percentage
I	24	80.00	22	73.30
II	6	20.00	8	26.70
Total	30	100	30	100
Chisqure	0.37			
Df	1			
p-value	0.54 (Not Significant)			

ASA status in both grups are statistically are insignificant

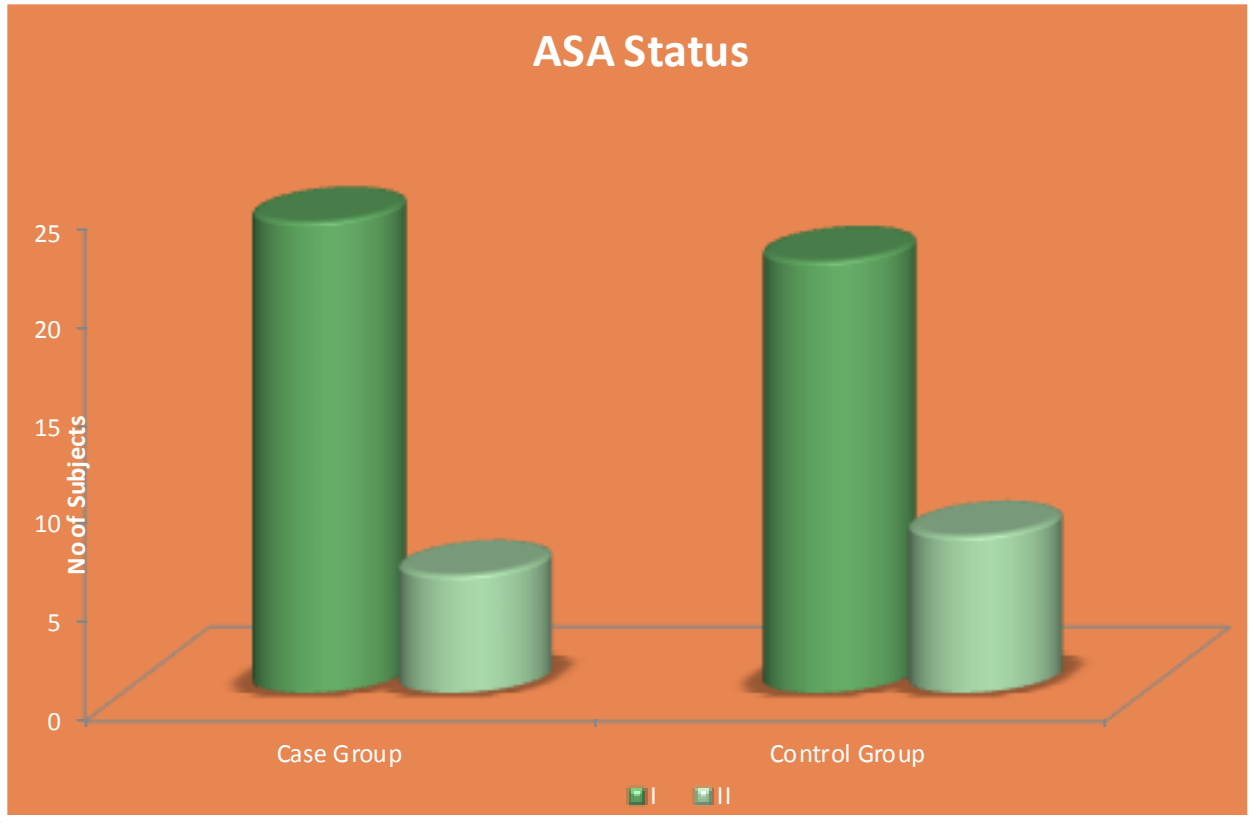


Table-6
VAS

	Case Group	**Control Group**
Mean	7.90	7.77
Sd	0.31	0.43
t-value	**1.39**	
Df	**58**	
p-value	**0.17 (Not Significant)**	

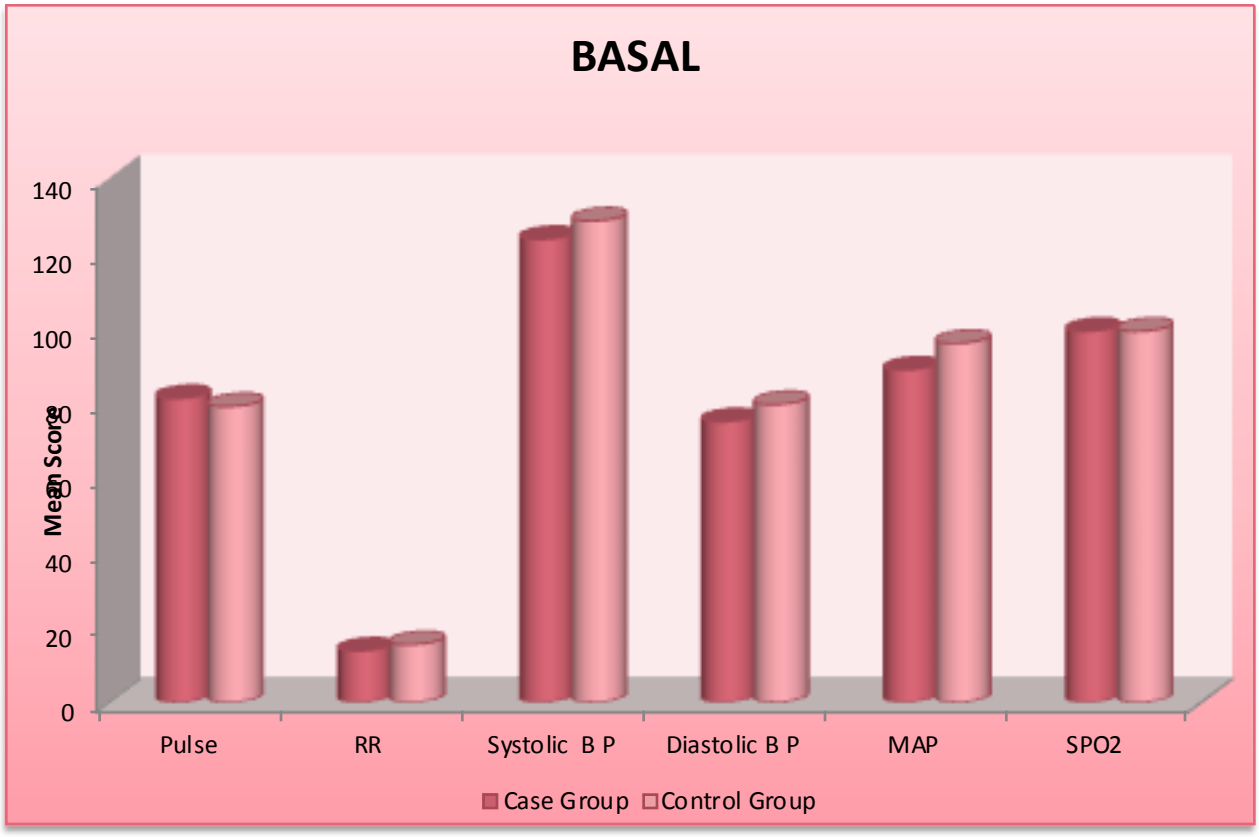
Preoperative VAS score in both groups are statistically insignificant

Table-7
Basal

	Case Group Mean ± sd	Control Group Mean ± sd	t-value	p-Value df=58
Pulse	81.07 ± 5.55	78.93 ± 5.72	1.47	0.15*
RR	13.67 ± 1.49	15.40 ± 1.98	3.83	0.000
Systolic B P	123.53 ± 10.94	128.47 ± 8.40	1.96	0.05
Diastolic B P	74.87 ± 9.24	79.47 ± 9.23	1.93	0.06*
MAP	88.67 ± 18.40	95.80 ± 8.05	1.47	0.06*
SPO2	99.00 ± 00.00	99.00 ± 0.00		

* - Not Significant
The preoperative VAS score, base line vital signs i.e. pulse rate, systolic ,diastolis blood pressure, respiratory rate, oxygen saturation were monitored and tabulated.

In both groups are statistically notsignificant.



CARDIOVASCULAR CHANGES:

Effects of buprenorphine on the heart rate, respiratory rate and mean arterial pressure in the intraoperative and postoperative period monitored . in both groups haemodynamic stability was maintained to near normal and statistically not significant. The results are tabulated as

Table-8
Pulse

	Case Group Mean ± sd	**Control Group Mean ± sd**	**t-value**	**p-Value df=58**
PRE	80.60 ± 5.71	78.93 ± 5.72	1.13	0.26*
0 Mint	81.87 ± 6.54	81.20 ± 5.29	0.43	0.67*
1 Mint	84.17 ± 9.44	83.13 ± 6.88	0.48	0.63*
3 Mint	85.00 ± 9.75	85.73 ± 6.66	0.34	0.74*
5 Mint	85.43 ± 11.51	86.20 ± 6.84	0.31	0.76*
10 Mint	86.83 ± 13.11	88.73 ± 6.05	0.72	0.47*
15 Mint	89.07 ± 10.96	89.00 ± 5.00	0.03	0.98*
30 Mint	85.33 ± 9.83	88.67 ± 4.99	0.46	0.65*
45 Mint	85.33 ± 9.30	86.27 ± 5.98	0.46	0.65*
1.00 Hour	82.60 ± 8.14	85.13 ± 5.11	1.44	0.15*
1.30 Hours	81.93 ± 6.38	82.93 ± 5.35	0.66	0.51*
2.00 Hours	80.67 ± 6.77	83.30 ± 5.39	1.98	0 .05
3.00 Hours	80.33 ± 5.73	82.93 ± 4.29	1.98	0.05
4.00 Hours	80.67 ± 5.90	81.27 ± 5.24	0.42	0.68*
5.00 Hours	80.60 ± 5.44	76.40 ± 6.00	2.84	0.01
6.00 Hours	79.87 ± 5.58	75.97 ± 5.89	2.63	0.01
8.00 Hours	81.07 ± 4.72	75.07 ± 5.96	4.32	0.000
12.00 Hours	81.20 ± 5.27	75.20 ± 4.63	4.69	0.000
24.00 Hours	80.67 ± 5.59	75.27 ± 4.88	3.98	0.000

* - Not Significant

There was no statistically significantchanges between study and control group

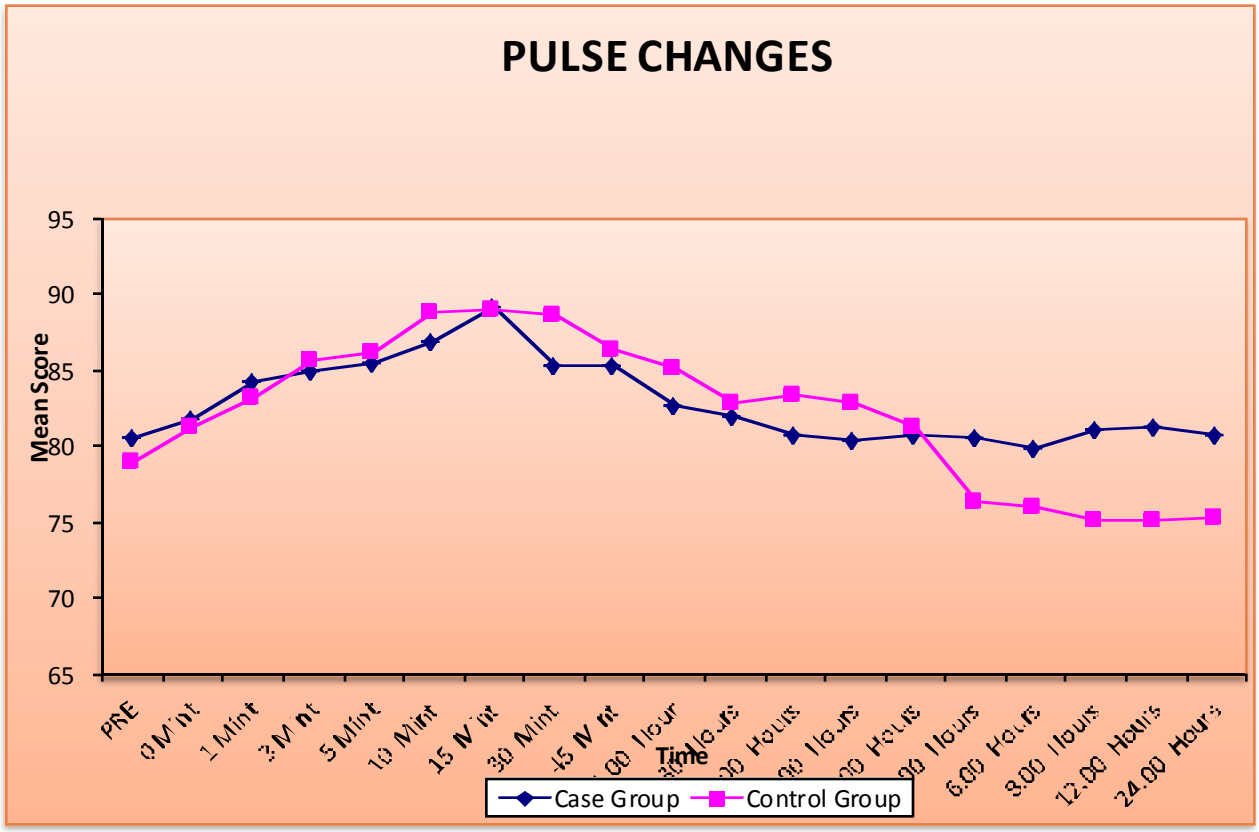


Table-9
RR

	Case Group Mean ± sd	Control Group Mean ± sd	t-value	p-Value df=58
PRE	13.73 ± 1.46	15.40 ± 1.98	3.72	0.000
0 Mint	13.67 ± 1.49	15.73 ± 1.87	4.72	0.000
1 Mint	13.53 ± 1.63	15.60 ± 2.13	4.22	0.000
3 Mint	14.27 ± 1.64	15.93 ± 2.26	3.27	0.002
5 Mint	14.87 ± 1.55	16.07 ± 2.13	2.49	0.02
10 Mint	14.20 ± 1.61	16.00 ± 2.17	3.66	0.001
15 Mint	14.27 ± 1.64	15.80 ± 1.99	3.26	0.002
30 Mint	14.40 ± 1.33	15.80 ± 1.85	3.37	0.001
45 Mint	14.20 ± 1.42	16.47 ± 1.72	5.57	0.000
1.00 Hour	14.00 ± 1.49	15.80 ± 2.12	3.80	0.000
1.30 Hours	13.93 ± 1.70	15.93 ± 1.93	4.26	0.000
2.00 Hours	13.93 ± 1.78	16.20 ± 1.77	4.95	0.000
3.00 Hours	13.93 ± 1.53	16.33 ± 1.67	5.81	0.000
4.00 Hours	13.73 ± 1.36	15.27 ± 1.44	4.24	0.000
5.00 Hours	13.60 ± 1.22	15.07 ± 1.36	4.39	0.000
6.00 Hours	14.27 ± 1.55	14.73 ± 1.44	1.20	0.23
8.00 Hours	14.00 ± 1.66	15.03 ± 1.71	2.37	0.02
12.00 Hours	14.33 ± 1.18	15.40 ± 1.91	2.61	0.01
24.00 Hours	14.60 ± 1.19	15.53 ± 1.94	2.24	0.03

* - Not Significant

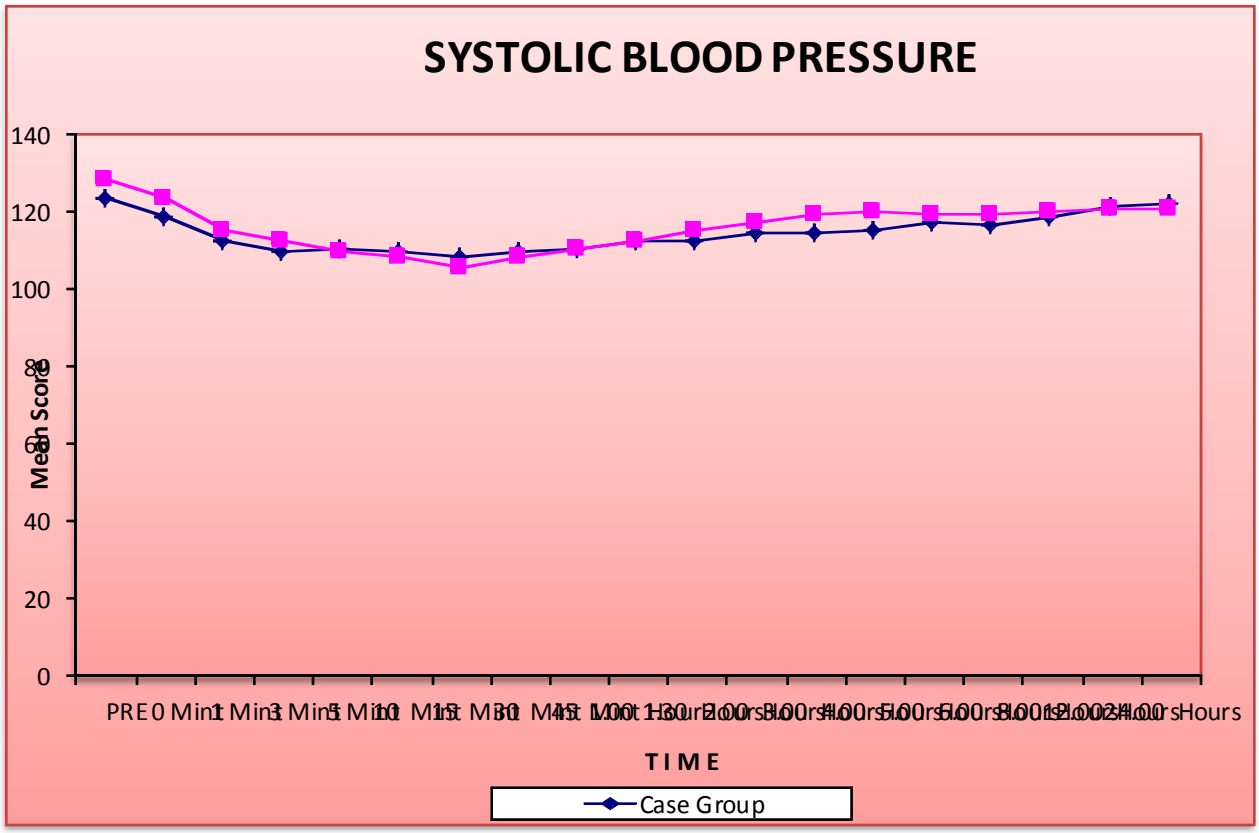
There was reduced respiratory rate in study group when compared to control group which is statistically significant.

Table-10

Systolic Blood Pressure (SBP)

	Case Group Mean ± sd	**Control Group Mean ± sd**	**t-value**	**p-Value df=58**
PRE	123.20 ± 11.20	128.47 ± 8.40	2.06	0.04
0 Mint	118.40 ± 8.26	123.53 ± 7.89	2.46	0.02
1 Mint	112.47 ± 7.22	115.40 ± 7.67	1.53	0.13*
3 Mint	109.80 ± 8.54	112.37 ± 7.71	1.22	0.23*
5 Mint	110.40 ± 6.98	109.83 ± 8.15	0.29	0.77*
10 Mint	109.93 ± 9.01	108.13 ± 5.92	0.91	0.36*
15 Mint	108.53 ± 6.43	105.40 ± 7.20	1.78	0.08
30 Mint	109.73 ± 7.37	108.07 ± 5.50	0.99	0.33*
45 Mint	110.33 ± 6.93	110.27 ± 4.16	0.05	0.96*
1.00 Hour	112.40 ± 6.65	112.13 ± 4.87	0.18	0.86*
1.30 Hours	112.53 ± 5.82	115.40 ± 6.06	1.87	0.07
2.00 Hours	114.27 ± 5.17	117.00 ± 5.35	2.01	0.05
3.00 Hours	114.73 ± 5.50	119.20 ± 6.76	2.81	0.01
4.00 Hours	115.40 ± 6.11	119.60 ± 6.94	2.49	0.02
5.00 Hours	117.20 ± 5.52	119.07 ± 5.84	1.27	0.21*
6.00 Hours	116.60 ± 6.61	119.53 ± 6.10	1.79	0.08*
8.00 Hours	118.40 ± 6.20	120.00 ± 6.95	0.94	0.35*
12.00 Hours	121.13 ± 6.82	120.53 ± 6.32	0.35	0.73*
24.00 Hours	122.00 ± 6.24	120.67 ± 7.03	0.78	0.44*

* - Not Significant


SYSTOLIC BLOOD PRESSURE
140
120
100
80
60
40
20
0
Mean Score
PRE
0 Min
1 Min
3 Min
5 Min
10 Min
15 Min
30 Min
45 Min
1 Hour
1.30 Hours
2.00 Hours
3.00 Hours
4.00 Hours
5.00 Hours
6.00 Hours
8.00 Hours
12.00 Hours
24.00 Hours
Hours
TIME
Case Group

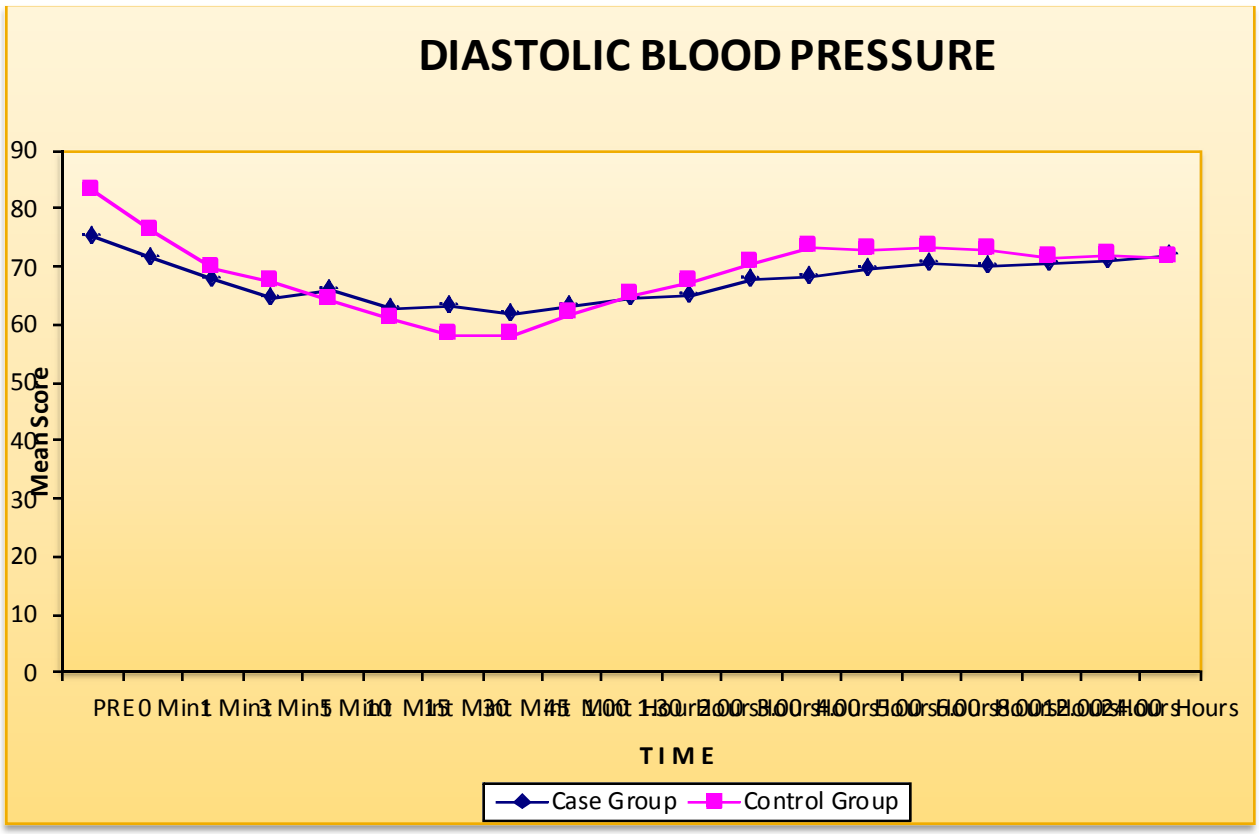
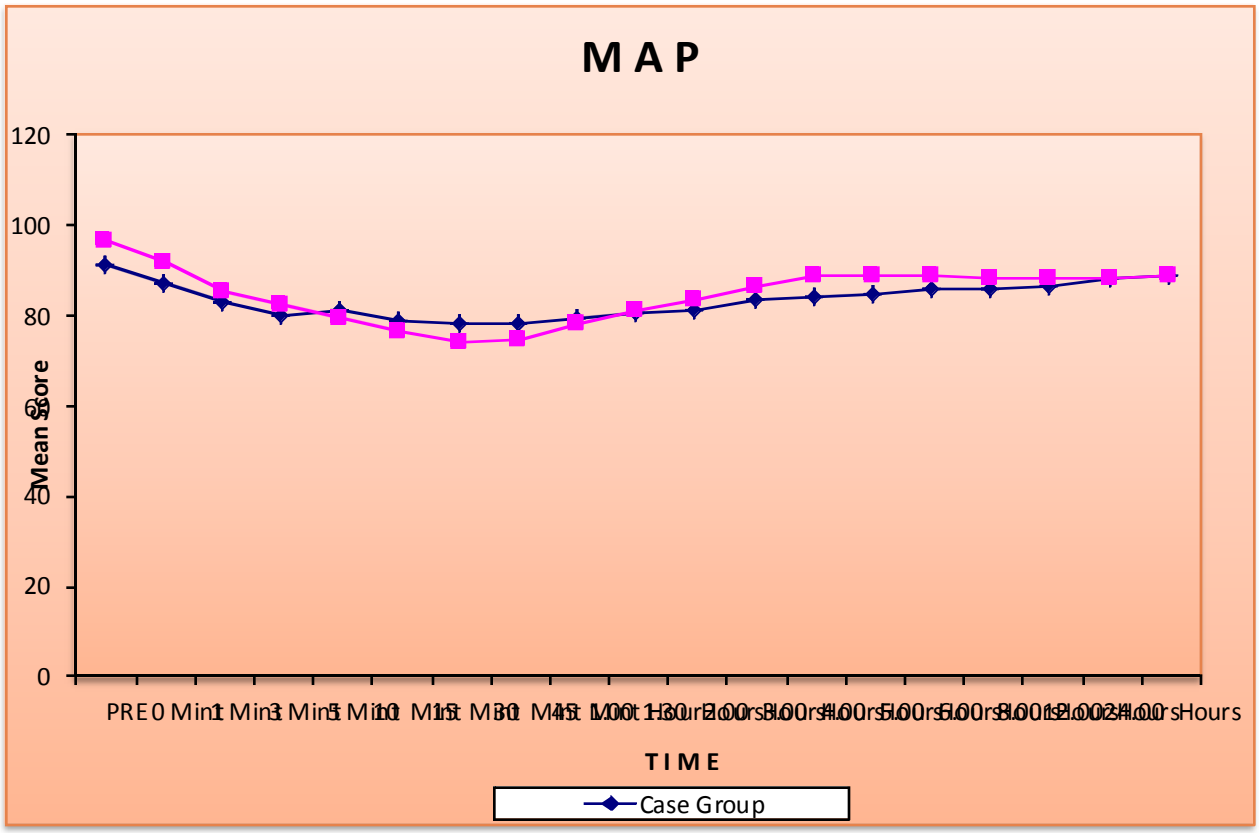

DIASTOLIC BLOOD PRESSURE
90
80
70
60
50
40
30
20
10
0
Mean Score
PRE
0 Min
1 Min
3 Min
5 Min
10 Min
15 Min
30 Min
45 Min
1 Hour
1.30 Hours
2.00 Hours
3.00 Hours
4.00 Hours
5.00 Hours
6.00 Hours
8.00 Hours
12.00 Hours
24.00 Hours
Hours
TIME
Case Group
Control Group

Table-11
Diastolic Blood Pressure

	Case Group Mean ± sd	**Control Group Mean ± sd**	**t-value**	**p-Value df=58**
PRE	75.20 ± 8.86	82.87 ± 14.97	2.41	0.02
0 Mint	71.40 ± 7.65	76.00 ± 9.57	2.06	0.04
1 Mint	67.93 ± 7.71	69.73 ± 7.39	0.92	0.36*
3 Mint	64.47 ± 9.65	67.27 ± 8.13	1.22	0.23*
5 Mint	66.00 ± 7.68	64.20 ± 7.25	0.93	0.35*
10 Mint	62.93 ± 8.56	60.73 ± 8.43	1.00	0.32*
15 Mint	63.13 ± 8.48	58.27 ± 7.22	2.39	0.02
30 Mint	61.93 ± 7.85	57.93 ± 5.67	2.26	0.03
45 Mint	63.33 ± 8.11	61.73 ± 5.60	0.89	0.38*
1.00 Hour	64.67 ± 6.88	65.00 ± 5.70	0.20	0.84*
1.30 Hours	64.93 ± 5.98	67.53 ± 6.53	1.61	0.11*
2.00 Hours	67.67 ± 7.36	70.60 ± 6.44	1.64	0.11*
3.00 Hours	68.33 ± 7.03	73.13 ± 6.14	2.82	0.01
4.00 Hours	69.40 ± 7.13	72.93 ± 5.96	2.82	0.01
5.00 Hours	70.40 ± 6.98	73.33 ± 5.16	2.08	0.04
6.00 Hours	70.20 ± 6.67	72.73 ± 6.25	1.85	0.07*
8.00 Hours	70.33 ± 5.15	71.67 ± 7.37	1.52	0.13*
12.00 Hours	71.20 ± 6.23	71.73 ±5.38	0.81	0.42*
24.00 Hours	71.87 ± 6.79	71.47 ± 5.75	0.36	0.72*

* - Not Significant


M A P
120
100
80
60
40
20
0
Mean Score
PRE
0 Min
1 Min
3 Min
5 Min
10 Min
15 Min
30 Min
45 Min
1 Hour
1.30 Hours
2.00 Hours
3.00 Hours
4.00 Hours
5.00 Hours
6.00 Hours
8.00 Hours
12.00 Hours
24.00 Hours
TIME
Case Group

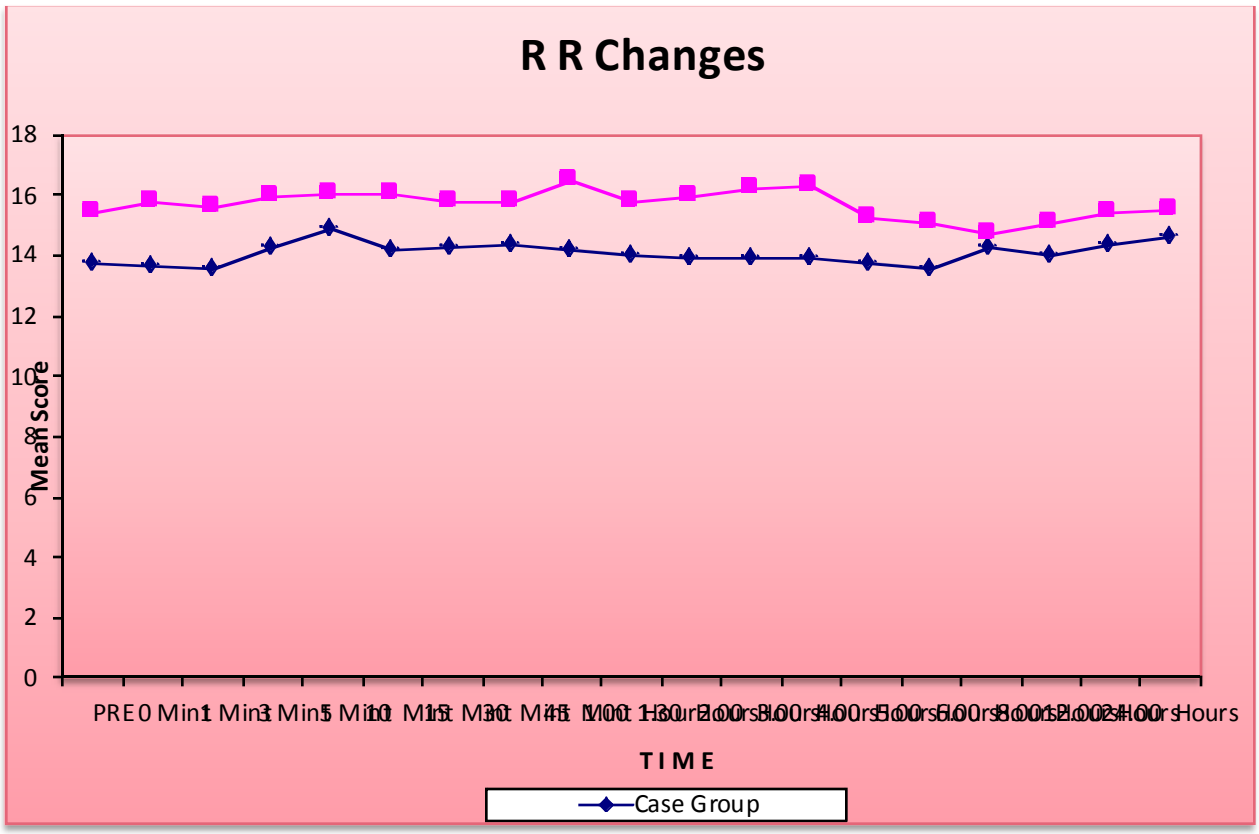

R R Changes
18
16
14
12
10
8
6
4
2
0
Mean Score
PRE
0 Min
1 Min
3 Min
5 Min
10 Min
15 Min
30 Min
45 Min
1 Hour
1.30 Hours
2.00 Hours
3.00 Hours
4.00 Hours
5.00 Hours
6.00 Hours
8.00 Hours
12.00 Hours
24.00 Hours
TIME
Case Group

Table-12

MAP

	Case Group Mean ± sd	**Control Group Mean ± sd**	**t-value**	**p-Value df=58**
PRE	91.20 ± 8.83	96.20 ± 10.24	2.03	0.05
0 Mint	87.07 ± 6.98	91.84 ± 8.02	2.46	0.02
1 Mint	82.78 ± 6.59	84.96 ± 6.55	1.28	0.20*
3 Mint	79.58 ± 8.63	82.30 ± 7.10	1.33	0.19*
5 Mint	80.80 ± 6.68	79.41 ± 6.54	0.81	0.42*
10 Mint	78.60 ± 7.93	76.53 ± 6.48	1.11	0.27*
15 Mint	78.27 ± 7.40	73.98 ± 5.71	2.51	0.02
30 Mint	77.87 ± 6.77	74.64 ± 5.17	2.07	0.04
45 Mint	79.00 ± 7.24	77.90 ± 3.97	0.73	0.47*
1.00 Hour	80.58 ± 6.02	80.71 ± 4.82	0.09	0.92*
1.30 Hours	80.80 ± 5.31	83.49 ± 5.54	1.92	0.06*
2.00 Hours	83.20 ± 5.69	86.07 ± 5.66	1.96	0.05
3.00 Hours	83.80 ±5.66	88.49 ± 5.74	3.26	0.002
4.00 Hours	84.73 ± 5.82	88.49 ± 5.25	2.63	0.01
5.00 Hours	86.00 ± 5.58	88.58 ± 4.62	1.95	0.06*
6.00 Hours	85.67 ± 5.77	88.33 ± 5.31	1.86	0.07*
8.00 Hours	86.36 ± 4.73	87.78 ± 6.58	0.96	0.34*
12.00 Hours	87.84 ± 5.75	88.00 ± 4.63	0.12	0.91*
24.00 Hours	88.87 ± 5.54	88.53 ± 5.07	0.24	0.81*

* - Not Significant

Systolic, diastolic blood pressure and MAP for 24 hours are tabulated above.

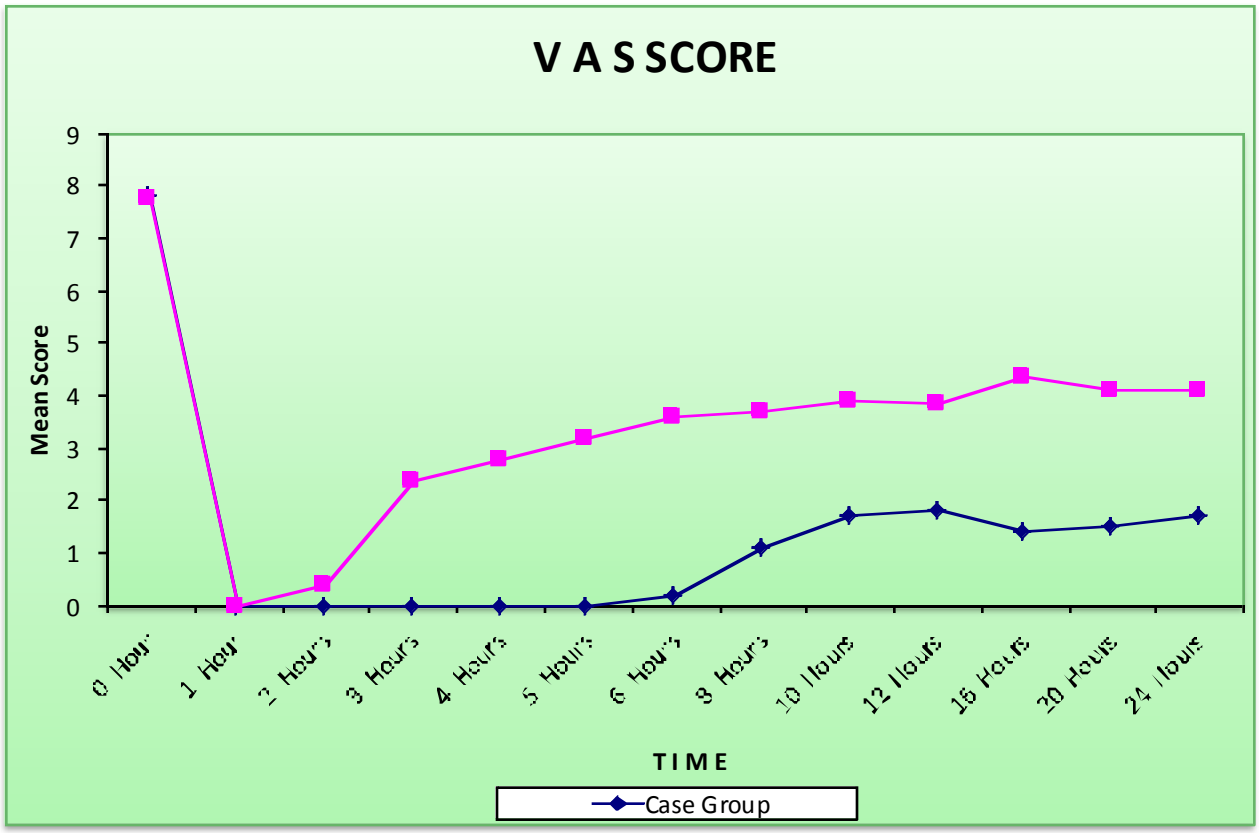
There was statistically no significant difference between study and control group.

Table-13 mean VAS score between study and control group for 24 hours during the intraoperative and postoperative period.

	Case Group Mean ± sd	**Control Group Mean ± sd**	**t-value**	**p-Value df=58**
0 Hour	7.83 ± 0.38	7.77 ± 0.43	0.64	0.07
1 Hour	-	-	-	
2 Hours	-	0.40 ±0.72	3.03	0.004
3 Hours	0.00	2.40 ± 0.81	16.16	0.000
4 Hours	0.00	2.80 ± 0.61	25.13	0.000
5 Hours	0.00	3.17 ± 0.91	19.00	0.000
6 Hours	0.17 ± 0.38	3.60 ± 1.00	17.53	0.000
8 Hours	1.10 ± 1.03	3.70 ± 0.79	10.96	0.000
10 Hours	1.70 ± 0.83	3.90 ± 1.06	8.91	0.000
12 Hours	1.80 ± 0.85	3.87 ± 1.07	8.91	0.000
16 Hours	1.40 ± 0.50	4.37 ± 1.03	14.16	0.000
20 Hours	1.53 ± 0.09	4.13 ± 1.14	11.44	0.000
24 Hours	1.73 ± 0.45	4.10 ± 1.16	10.46	0.000

* - Not Significant

VAS score is less in study group than in control group , which is statistically significant .


V A S SCORE
Mean Score
9
8
7
6
5
4
3
2
1
0
0 Hour
1 Hour
2 Hours
3 Hours
4 Hours
5 Hours
6 Hours
8 Hours
10 Hours
12 Hours
16 Hours
20 Hours
24 Hours
TIME
Case Group

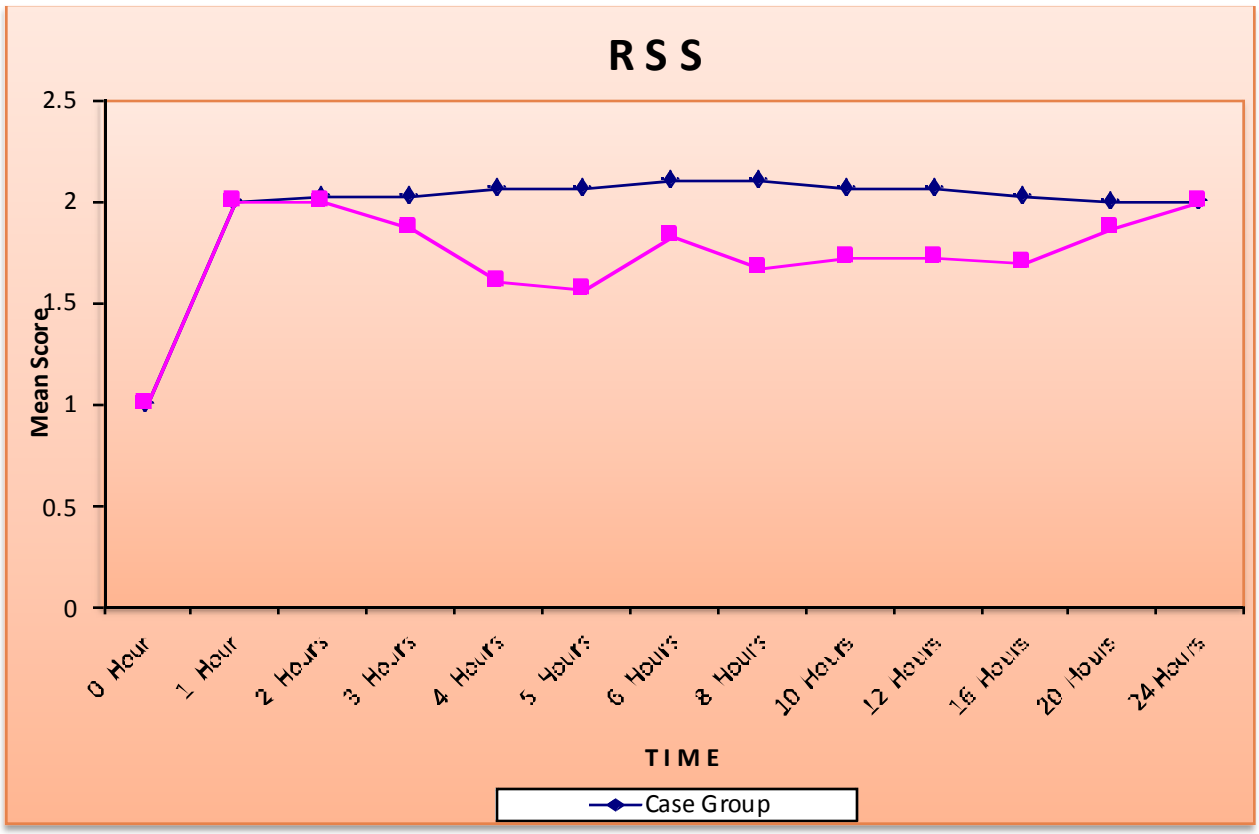

R S S
Mean Score
2.5
2
1.5
1
0.5
0
0 Hour
1 Hour
2 Hours
3 Hours
4 Hours
5 Hours
6 Hours
8 Hours
10 Hours
12 Hours
16 Hours
20 Hours
24 Hours
TIME
Case Group

Table-14 RAMSAY SEDATION SCORE

	Case Group Mean ± sd	**Control Group Mean ± sd**	**t-value**	**p-Value df=58**
0 Hour	1.00 ± 0.00	1.00 ± 0.00	-	-
1 Hour	2.00 ± 0.00	2.00 ± 0.00	-	-
2 Hours	2.03 ± 0.18	2.00 ± 0.00	1.00	0.32*
3 Hours	2.03 ± 0.18	1.87 ± 0.35	2.34	0.02
4 Hours	2.07 ± 0.25	1.60 ± 0.50	4.57	0.000
5 Hours	2.07 ± 0.25	1.57 ± 0.50	4.85	0.000
6 Hours	2.10 ± 0.31	1.83 ± 0.38	3.00	0.004
8 Hours	2.10 ± 0.31	1.67 ± 0.48	4.18	0.000
10 Hours	2.07 ± 0.25	1.73 ± 0.45	3.54	0.001
12 Hours	2.07 ± 0.25	1.73 ± 0.45	3.54	0.001
16 Hours	2.03 ± 0.18	1.70 ± 0.47	3.65	0.001
20 Hours	2.00 ± 0.00	1.87 ± 0.35	2.11	0.04
24 Hours	2.00 ± 0.00	2.00 ± 0.00	-	-

* - Not Significant

Study group patients show increased sedation score which is statistically significant comparing to control group.

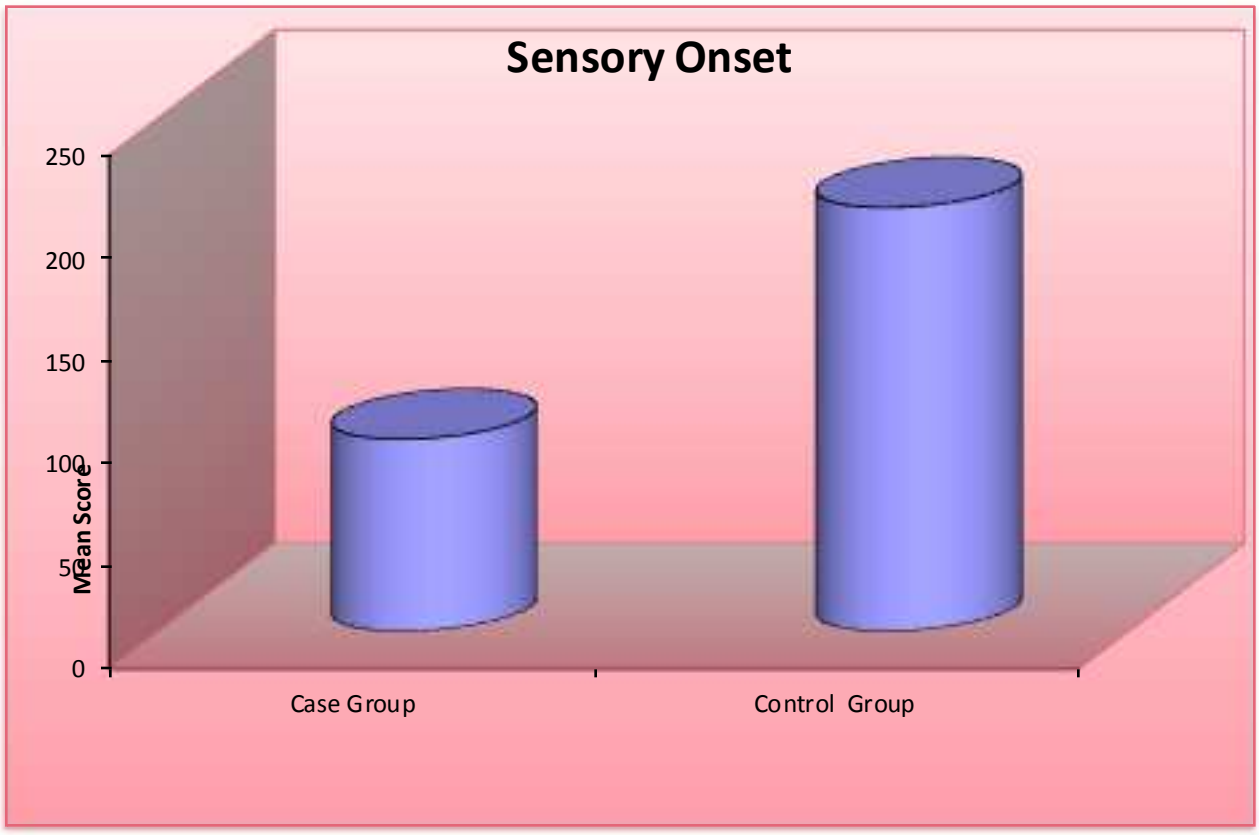
Table-15

ONSET OF SENSORY ANALGESIA

	Case Group	**Control Group**
Mean	93.43	206.20
Sd	32.58	40.06
Range	**50 - 192**	**135 – 312**
t-value	**11.96**	
Df	**58**	
p-value	**0.000 (Significant)**	

The mean duration of onset of sensory analgesia in study group is 93.43±SD32.58 seconds. the mean duration in control group is 206.20±SD40.06 seconds. When compared to control group study group patients have increased

onset of sensory analgesia which is statistically significant



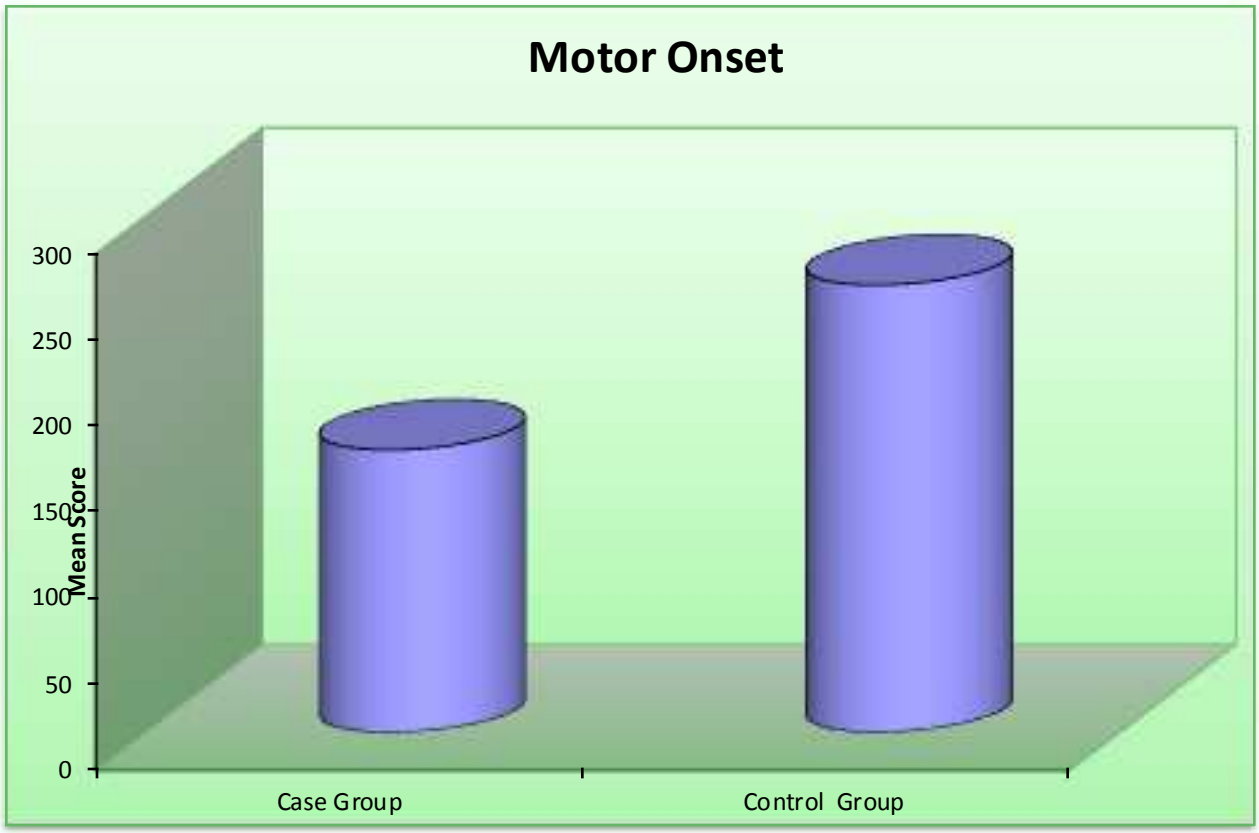


Table-16
Onset of motor blockade

	Case Group	**Control Group**
Mean	164.03	259.83
Sd	62.11	38.05
Range	**70 – 300**	**180 -360**
t-value	**7.20**	
Df	**58**	
p-value	**0.000 (Significant)**	

Onset of motor blockade in study group is 164.03 seconds with SD 62.11 seconds. In control group mean is 259.83seconds with SD 38.05 seconds.Onset of motor blockade is earlier in study group which is statistically significant when comparing to control group.

Table-17

Analgesia Duration

	Case Group	**Control Group**
Mean	659.63	190.70
Sd	96.33	22.86
Range	**455 - 815**	**152 – 275**
t-value	**25.94**	
Df	**58**	
p-value	**0.000 (Significant)**	

Total duration of analgesia in study group is 659.63±96.33 minutes. In control group is 190.70±22.86 minutes.Duration of analgesia is prolonged in study group

when compared to control group which is significant statistically.

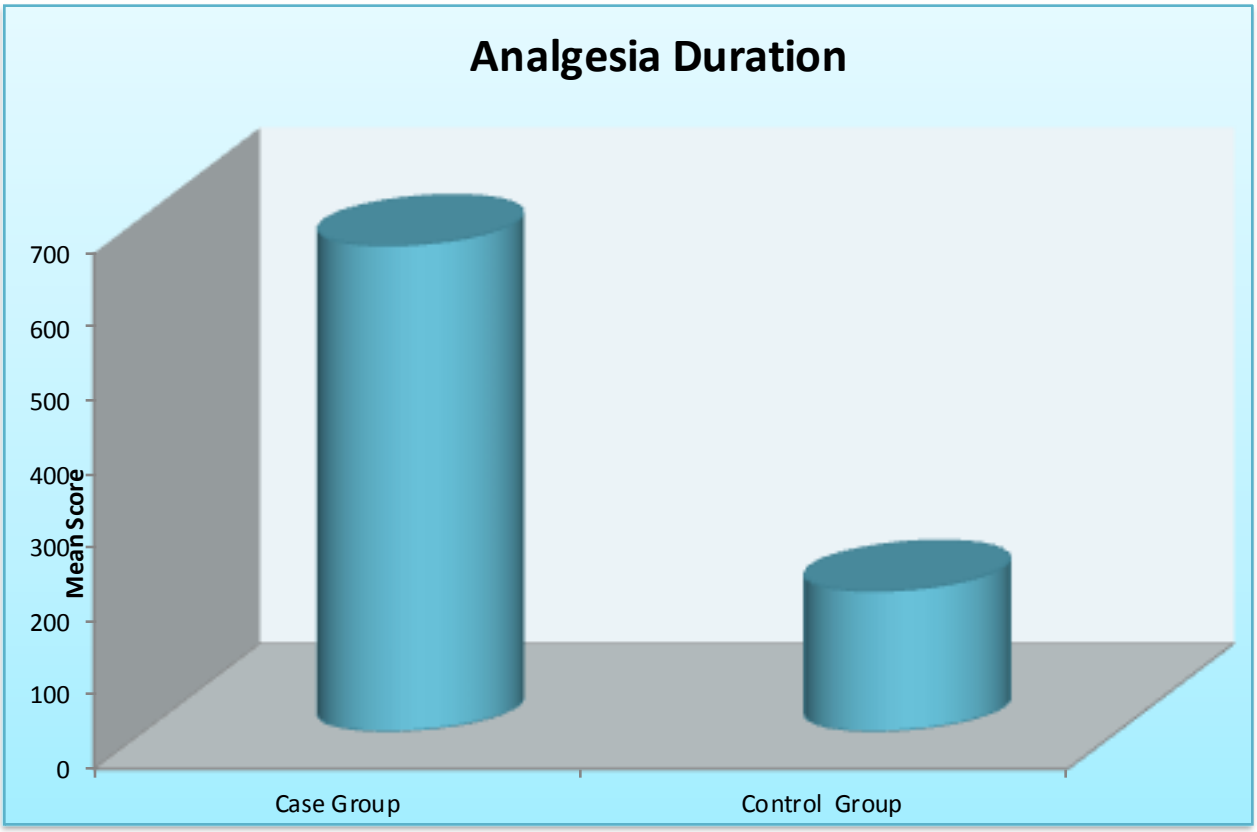
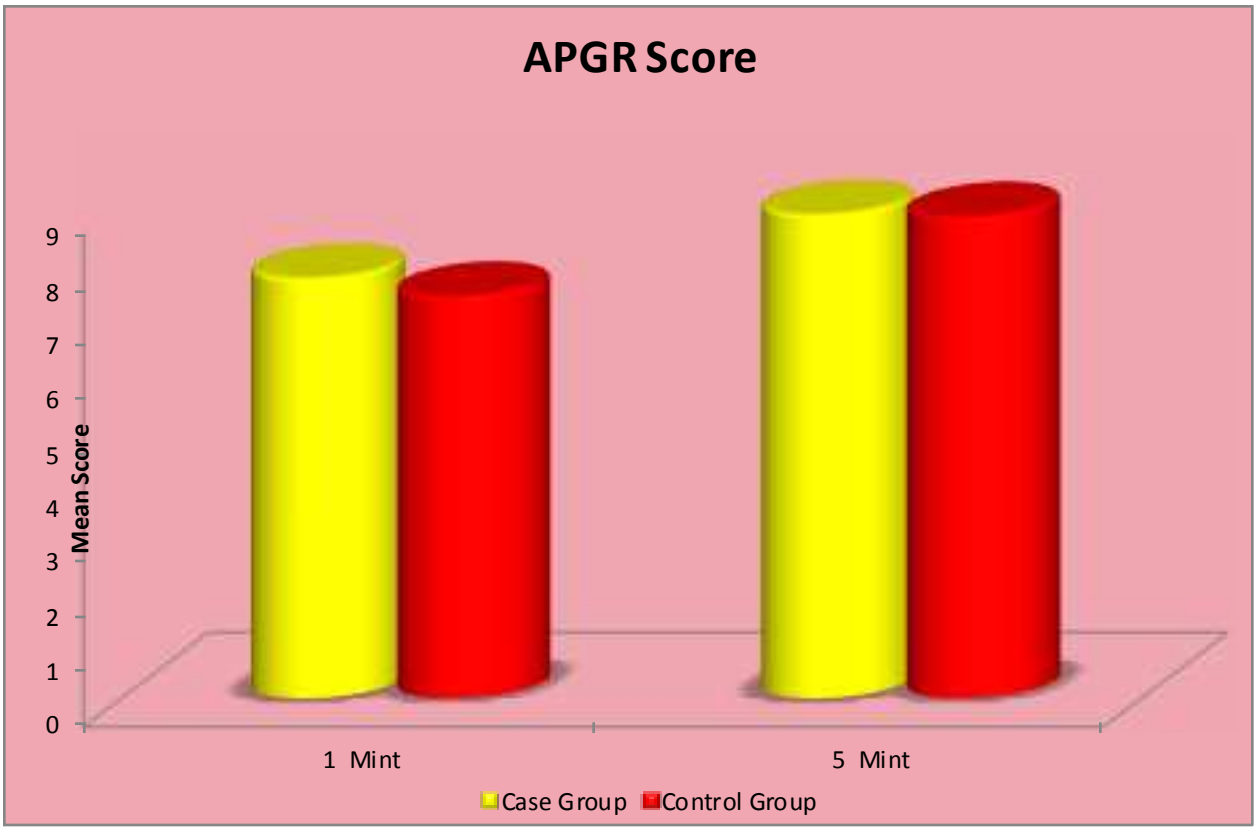


Table-18

APGAR SCORE

	Case Group Mean ± sd	Control Group Mean ± sd	t-value	p-Value df=58
1 Mint	7.70 ± 0.60	7.37 ± 0.62	2.13	0.04
5 Mint	8.87 ± 0.35	8.83 ± 0.38	0.36	0.72*

* - Not Significant



1minute Apgar score in study case is 7.70±0.60. in control 7.37±0.62 which is significant. But in 5 minute Apgar score in study case 8.87±0.35 and in control case 8.83±0.38 which is not significant.

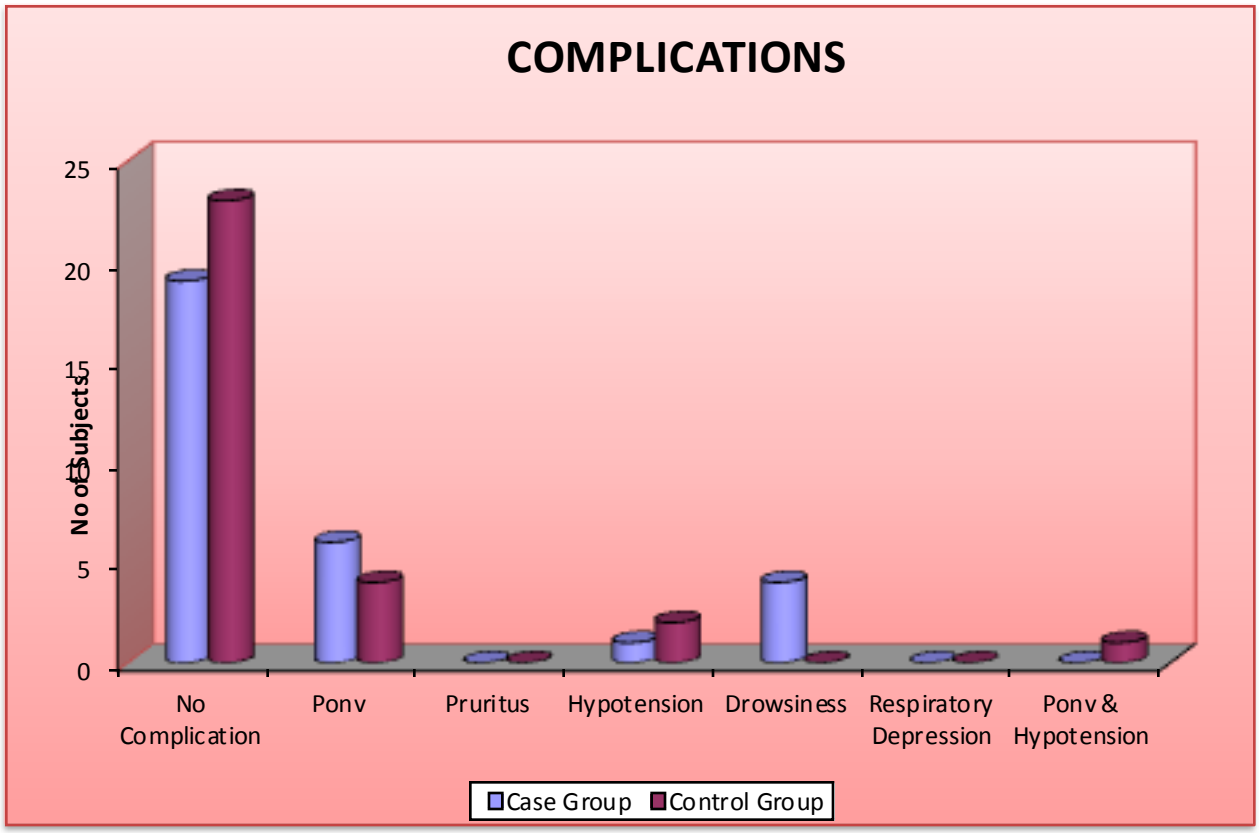

COMPLICATIONS
No of Subjects
25
20
15
10
5
0
No Complication
Ponv
Pruritus
Hypotension
Drowsiness
Respiratory Depression
Ponv & Hypotension
Case Group
Control Group

Table -19
Complications

Complications	Case Group		Control Group	
	Number	Percentage	Number	Percentage
No Complication	19	63.31	23	76.70
Ponv	6	20.00	4	13.30
Pruritus	0	-	0	-
Hypotension	1	3.30	2	6.70
Drowsiness	4	13.30	0	-
Respiratory Depression	0	-	0	-
Ponv & Hypotension	0	-	1	3.30
Chi-square	6.11			
Df	4			
p-value	0.19 (Not Significant)			

6 patients(20%) in study group and 4(13.30) patients in control group has PONV. 13.30% of patients in study group has drowsiness.

Overall complications are statistically not significant in both groups.

DISCUSSION

DISCUSSION

Any method of postoperative analgesia must be simple and safe. Also it should be clinically appropriate and evidence based. But most of the patients using intramuscular or intravenous opioid drugs are left with unrelieved pain.

Nowadays Spinal anaesthesia has become the preferred technique of choice for patients undergoing cesarean section. Because it is a simple reliable and easier technique to perform and provide rapid onset of the dense blockade, results in reduced need of supplemental IV analgesics.

Pregnant patients require small dose of spinal local anaesthetics due to (i) smaller volume of CSF, (ii) cephalad movement of hyperbaric local anaesthetics in supine position, (iii) greater sensitivity of nerve fibres.

Adjuvants like opioids improve the quality of intraoperative anaesthesia, prolong the postoperative analgesia and reduce the dose and side effects of local anaesthetics.

Wang et al.,(1979) the first clinician used opioids intrathecally in man. Addition of opioids in spinal to the pregnant patients coming for caesarean section, decreases the incidences of hypotension and exaggerated sympathetic block is absent. Hence during the postoperative period patients can ambulate early , mother

can breast feed their child effectively and hence effective bonding between the mother and child will occur.

Buprenorphine is a mixed agonist – antagonist type of opioid drug. It is highly lipid soluble, has high affinity for opioid receptor, prolonged duration of action. During pregnancy there is increased chance of thromboembolic disease, so good postoperative pain relief provided by intrathecal buprenorphine improve early mobilization thereby reduce the chance of thromboembolism.

In our study we used intrathecal buprenorphine as postoperative pain relief drug in patients undergoing elective cesarean section. sixty patients are divided randomly into two groups(30 each). GroupA received 1.7ml of hyperbaric 0.5% bupivacaine with 0.2 ml (60µg) of buprenorphine and GroupB received 1.7ml of hyperbaric 0.5% bupivacaine with 0.2ml of 0.9% normal saline.

Sarvella et al., demonstrated that low dose spinal bupivacaine 9mg with fentanyl 20µg provide satisfactory analgesia in cesarean section. In the study of sunil dixit et al.,

Buprenorphine increses onset of sensory block without affecting motor blockade and hemodynaemic changes. In our study onset of sensory analgesia is significantly earlier ie., 1-3 mins. In dixit et al., study onset of analgesia in study

group is 1.85±1.39min. this is due to high lipid solubility and high affinity for opioid receptors.

The drug required during the postoperative period is less than that required when they are treated prophylactically. In pregnancy lesser amount of drug will produce profound analgesia because of increased sensitivity of nerve fibres. In our study the amount of drug required is 60µg.

In our study, all the patients were comfortable intraoperatively and with in the first two hour of postoperative period. From third hour onwards half of the patients in control group VAS score is more than three and demanded analgesia.in twentyfour hours period requirement of resque analgesia in control group is more than three times.

In study group during the first six hours almost all the patients are comfortable and VAS is 0. Upto eight hour period three patients demanded analgesia. In tenth hour five patients demanded analgesia and in twelveth hour eight patients needed analgesia. And fifteen patients required no analgesia during the 24hour period. All the patients required one dose of resque analgesia only.

The mean duration of analgesia in our study is 659.63±96.33 min. according to safia et al., mean duration of analgesia with buprenorphine 1µg/kg is 475.6±93.7 min. according to Lipp et al., upto thirteen hours of analgesia with

0.15mg of intrathecal buprenorphine. According to sunil dixit et al., mean duration of analgesia is 491.26±153.97min. with G.Capogna et al study(1988) mean duration of analgesia with 0.045mg of buprenorphine is 7 to 12 hours. Our study correlates with capogna et al.,

Capogna et al., suggested duration of analgesia is dose dependent and buprenorphine increases the duration of analgesia in our study.

Buprenorphine has prolonged duration of action , is due to complex receptor kinetics. Buprenorphine has high affinity to opiate receptors. It forms avid complex with the receptor , tend to persist for long duration of period. The opiate receptor affinity for buprenorphine is 50 times more than that of morphine.

The high lipid solubility and high affinity for opiate receptors of buprenorphine explains buprenorphine's longer duration of action when compared to other lipid soluble drugs like fentanyl which produces short lived analgesia due to rapid clearance from spinal cord sites.

Intraoperatively quality of analgesia was excellent in study group . visceral pain or tractional pain , pain during exteriorization of uterus was obtunded due to favourable properties of opiate receptors.(Shah etal.,).

The major side effects of buprenorphine seen in our study was drowsiness and postoperative nausea and vomiting.

Four patients in our study group was in the state of drowsy but all the patients are arousable easily.

Delayed respiratory depression is a known side effect of buprenorphine. Early respiratory depression occurs within one hour , due to increased vascular uptake and is transient.(Bromage etal.,) . Delayed respiratory depression is more intense and prolonged.

Respiratory depression is due to cephalad spread of opioids in the CSF and reaches opiate receptors which is located in ventral pons medulla. In study of Capogna etal., there was no respiratory depression in any of his cases received intrathecal buprenorphine. According to Harcus etal., the drug associated respiratory depression was estimated tobe less than 1%. Also in the studies of Safia etal., sunil dixit etal., there was no respiratory depression in their study cases. Our study correlates with Capogna etal., safiaetal., sunil dixit etal.,

Water soluble drugs like morphine produce more respiratory depression than other lipid soluble opioids.

Nausea and vomiting is due to rostral spread of opioid in CSF to intrathecal structures including vomiting centre and chemoreceptor trigger zone in the vascularized area postrema in the floor of fourth ventricle.

Incidence of post operative nausea and vomiting is none to 20% in studies done by Dixit etal., Lanz etal., Sen etal., Safiya etal.,

In our study incidence of postoperative nausea and vomiting in study group is 20% and control group 13.3%. our study correlates with Dixit etal., safiya etal., all the patients relieved by inj. Ondensetran 8mg intravenously.

Sedation score according to Ramsay Sedation Score scale of 1-6 measured in postoperatively. When compared with control group, study group patients has statistically significant sedation score. Four patients had a sedation score of three in study group upto eight to sixteen hours .

Facial pruritus by opioids is due to rapid penetration of opioids to caudal portion of the nucleus of the spinal tract of trigeminal nerve. According to Sunil dixit etal., safiya etal., there was no cases reported of facial pruritus. In our study group no cases of pruritus reported. Study correlates with Sunil dixit etal., safiya etal.,

There was no significant changes in hemidynamic variability both in study group and control group during intraoperative and postoperative period. In our study intraoperative complications like hypotension and bradycardia in both groups are comparable and statistically insignificant. There was no significant requirement of crystalloid and ephedrine hydrochloride. According to Sunil dixit etal., saxena etal., Capogna etal., there was no significant changes in pulse rate BP and respiratory rate attributable to spinal buprenorphine. Our study correlates with Sunil dixit atal., capogna etal., saxena etal.,

Apgar score was used to monitor neonatal wellbeing after birth during 1min and 5min interval period. The pediatrician could not able to find any significant differences between study and control group after 5min. intrathecal opioids are associated with less neonatal drug transfer than any other method , given that smaller doses are used for intrathecal administration. Johnson k., study finds 5minutes Apgar Score was highly predictive of respiratory distress syndrome.

In our study the drug buprenorphine is chosen because it is easily available and highly lipophilic drug . so the drug can diffuse from CSF to neuraxis faster and less duration of stay in CSF . there is less likelihood of rostral spread hence less chance of respiratory depression. So it was decided to compare the quality and duration of postoperative analgesia provided by buprenorphine.

The route of administration of additives in our study was by single shot subarachnoid injection. Subarachnoid block procedure is commonly done in anaesthetic practice and easier technique when compared to epidural technique.

None of the patient has exhibited any untoward serious cardiovascular respiratory and CNS effects and none of the babies affected, which proved that buprenorphine is safe and suitable agent for postoperative pain relief by intrathecal route. When longer duration of post operative pain relief is needed buprenorphine can be a suitable drug for pregnant patients because of prolonged duration of action.

Spinal opiate analgesia is better than any other route because smaller dose is sufficient , thereby reducing the side effects and patients are not unduly sedated and the duration of analgesia is longer than the parenteral route thereby repeated injections are avoided.

Spinal opiates better than spinal local anaesthetics in that there is no motor blockade and less haemodynamic changes. The optimal dose of intrathecal administration is lesser than the dose for epidural route.

The addition of buprenorphine to local anaesthetics has not interfered with its action like duration of action , quality of motor and sensory blockade ,

quality of analgesia or incidence of intraoperative and post operative complications like bradycardia, hypotension, nausea, vomiting is considered.

Buprenorphine has a definite edge over morphine because better concentration are achieved in the spinal cord and very little amount is left in CSF.

A single intrathecal buprenorphine with bupivacaine has produced not only a satisfactory intraoperative anaesthesia but prolonged duration of analgesia during the postoperative period upto 13-14hours of duration. Thereby avoiding the repeated intramuscular or intravenous injections and also improve morale of the patient.

Buprenorphine 60µg with hyperbaric 0.5% bupivacaine 1.7ml is safe , cheap and provides good and prolonged duration of postoperative analgesia without any significant maternal and neonatal side effects.

But according to Stoelting the patients receiving intrathecal opioids should be under close monitoring for adequacy of breathing but suggests that low dose neuraxial adminiatration of narcotics as in our study does not obligate observation in an intensive care environment.

SUMMARY

SUMMARY

A clinical study was done to evaluate the efficacy , duration of post operative pain relief and to know the quality of analgesia provided by intrathecal opioids added to local anaesthetic agents.

The study was undertaken in 60 patients of ASA I and II posted for elective cesarean section for post operative pain relief.

GroupA – 30 patients – received 1.7ml of hyperbaric 0.5% bupivacaine with buprenorphine 0.2ml(60µg).

GroupB – 30 patients – received 1.7ml of hyperbaric 0.5%bupivacaine with 0.2ml 0f 0.9% normal saline.

- Onset of sensory analgesia is significantly increased(1-31/2min) in patients receiving buprenorphine than control group.
- Onset of motor blockade also significantly increased in study group 1-5min.
- Postoperative analgesia was upto 13-14hours in groupA(study)with SD.96.33min than control group B 21/2 – 41/2 hours.
- There was no statistically significant changes in pulse rate, respiratory rate, blood pressure , oxygen saturation and neonatal apgar score.

- There was no respiratory depression in study group and few patients had a sedation score >3 which is statistically significant. There was no statistically significant complications in both groups.

CONCLUSION

CONCLUSION

Intrathecal buprenorphine is suitable drug for postoperative analgesia in patients undergoing cesarean section, it enhances onset of sensory blockade without affecting motor blockade and sympathetic activity. Anaesthesia was superior when buprenorphine is mixed with bupivacaine (0.5%) as compared to bupivacaine alone. The benefits of opiates are significant when used intrathecally and outweighs the side effects. Subarachnoid block is easy to perform , more predictable and the drug is easily available. So this combination of drugs can be used for postoperative analgesia in elective cesarean section.

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PROFORMA

PROFORMA

NAME: AGE :

IP NO: SEX : DIAGNOSIS :

ASA/MMS: SURGERY :

Group : Height: Weight :

Preoperative assessment:

H/o HT/DM/IHD/EPILEPSY/TB/ALLERGY

H/o PREVIOUS SURGERY/ ANAESTHESIA

GENERAL EXAMINATION

Nutritional status/ Pallor/Hydration/icterus/cyanosis/clubbing/pedal oedema

BASE LINE VITAL SIGNS

Pulse rate :

Blood pressure :

Respiratory rate :

Temperature :

SYSTEMIC EXAMINATION

CVS : RS: PA: CNS:

INVESTIGATION

Hb%/ PCV :

Blood group :

Blood urea :

Sugar :

Serum creatinine :

Urine Routine : Albumin/sugar

Bleeding time :

Clotting time :

ANAESTHESIA TECHNIQUE :

EVENTS	DRUGS	TIME	RSS	VAS		PR	RR	BP	SpO2	IVF
				rest	movement					
Pre op										
Spinal	0MIN									
	1MIN									
	3MIN									
	5MIN									
	10MIN									
	15MIN									
	20MIN									
	25MIN									
	30MIN									
	35MIN									
	40MIN									
	45MIN									

	60MIN									
	1 1/2HR									
	2HR									
	3HR									
	4HR									
	5HR									
	6HR									
	8HR									
	12HR									
	24HR									

NEONATAL APGAR SCORE

1MIN	
5MIN	

EVENTS	TIME
ONSET OF SENSORY ANALGESIA	
ONSET OF MOTOR BLOCKADE	
SURGICAL INCISION	
SKIN INCISION TO BABY DELIVERY	
UTERUS CLOSURE	
END OF SURGRY	
ONSET OF PAIN (VAS-3)	

SIDE EFFECTS	Yes/no	TREATMENT	REMARKS
PONV			
PRURITUS			
HYPOTENSION			
BRADYCARDIA			
DROWSINESS			
RESPIRATORY DEPRESSION			

STUDY GROUP-A																
S.NO	NAME	AGE	SEX	WEIGHT	HEIGHT	DIAGNOSIS	ASA	DRUG	RSS	VAS	PULSE	RR	SBP	DBP	MAP	SPO2
1	SANDHYA	24	FEMALE	68	156	previous lscs	1	1	1	8	86	14	100	62	2	99
2	kalpana	22	FEMALE	64	158	G2/mobile head	1	1	1	8	80	12	120	84	96	99
3	Roopavathy	25	FEMALE	68	155	previous lscs	1	1	1	8	82	14	138	86	103.3333	99
4	sathya	21	FEMALE	68	160	primi	1	1	1	8	80	12	130	84	99.33333	99
5	kalaiselvi	30	FEMALE	64	156	previous lscs	1	1	1	7	86	14	120	70	86.66667	99
6	Hepsiba	20	FEMALE	67	150	primi/mobile head	1	1	1	7	88	16	120	80	93.33333	99
7	Jaffni	21	FEMALE	50	156	primi/breech	1	1	1	8	88	12	122	80	94	99
8	Shanthi	27	FEMALE	60	152	G2/twin pregnancy	1	1	1	8	72	16	112	68	82.66667	99
9	Gomathy	21	FEMALE	62	156	previous lscs/anaemia	2	1	1	8	78	14	118	64	82	99
10	Afrose	28	FEMALE	68	155	previous lscs	1	1	1	8	80	14	112	80	90.66667	99
11	Lalitha	28	FEMALE	88	155	previous lscs	1	1	1	8	82	12	130	80	96.66667	99
12	Sathya	26	FEMALE	56	142	primi/oligohydramnios	1	1	1	8	74	14	126	84	98	99
13	Jeevitha	21	FEMALE	65	158	primi/polyhydramnios	1	1	1	8	82	14	114	80	91.33333	99
14	Kalaivani	30	FEMALE	62	154	primi/PIH	2	1	1	8	78	12	130	70	90	99
15	Shenbagavalli	31	FEMALE	78	162	previous lscs	1	1	1	8	78	14	120	70	86.66667	99
16	Kannagi	26	FEMALE	74	160	previous lscs	1	1	1	8	72	12	110	70	83.33333	99
17	Renuka	26	FEMALE	67	158	G2P2/BREECH	1	1	1	8	88	14	130	80	96.66667	99
18	Sugapriya	21	FEMALE	60	158	primi/breech	1	1	1	7	92	16	140	80	100	99
19	Kalaivani	37	FEMALE	58	157	previous lscs	1	1	1	8	72	14	138	86	103.3333	99
20	shyamala	20	FEMALE	48	153	primi/mobile head	1	1	1	8	84	14	130	70	90	99
21	Durgadevi	20	FEMALE	65	158	G2P2/BREECH	1	1	1	8	78	16	130	80	96.66667	99
22	Kannika	30	FEMALE	62	153	previous lscs	1	1	1	8	78	12	122	74	90	99
23	Lakshmi	23	FEMALE	47	144	primi/short stature	1	1	1	8	80	12	118	72	87.33333	99
24	Vasanthi	24	FEMALE	68	152	primi/mobile head	1	1	1	8	86	16	112	62	78.66667	99
25	Malathy	22	FEMALE	64	153	previous lscs	1	1	1	8	90	16	110	70	83.33333	99
26	Banumathy	25	FEMALE	76	160	previous lscs	1	1	1	8	82	12	140	90	106.6667	99
27	Vanitha	32	FEMALE	66	152	Elderly primi	2	1	1	8	72	12	150	90	110	99
28	Vijayalaxmi	34	FEMALE	64	156	previous lscs/PIH	2	1	1	8	78	12	124	60	81.33333	99
29	Divya	24	FEMALE	60	152	previous lscs/PIH	2	1	1	8	80	14	120	60	80	99
30	Devi	28	FEMALE	70	158	previous lscs/anaemia	2	1	1	8	86	14	120	60	80	99

PULSE																			
S.NO	PRE	0MIN	1MIN	3MIN	5MIN	10MIN	15MIN	30MIN	45MIN	60MIN	90MIN	120MIN	180MIN	240MIN	300MIN	360MIN	8HR	12HR	24HR
1	86	90	88	72	68	97	98	86	90	88	90	84	82	80	84	80	80	82	82
2	80	80	84	82	82	88	86	84	90	92	80	84	86	84	86	86	86	88	88
3	82	86	88	96	96	94	94	94	90	84	80	82	80	86	80	84	84	80	80
4	80	82	84	86	84	86	88	84	86	88	86	86	84	80	88	72	80	80	68
5	86	88	94	92	94	86	90	92	90	88	86	84	86	86	82	70	80	86	86
6	88	90	90	88	92	94	102	102	102	78	78	78	72	72	78	78	82	82	80
7	88	86	114	110	74	78	76	78	94	92	90	80	84	84	86	80	92	88	84
8	72	74	78	94	98	96	94	94	98	94	92	90	90	86	86	80	80	84	84
9	78	82	90	76	76	94	94	92	90	86	80	80	82	86	86	88	84	88	86
10	80	80	90	96	90	96	102	100	96	90	94	92	70	68	68	62	72	74	74
11	82	88	92	94	102	104	100	82	84	82	84	82	92	90	82	82	80	80	80
12	74	72	80	94	108	104	106	100	88	90	84	82	82	82	82	84	84	86	80
13	82	82	84	80	94	98	96	82	84	82	82	80	82	82	84	80	80	80	80
14	78	70	74	76	74	70	80	70	70	70	70	72	72	68	74	76	74	72	72
15	78	80	80	82	82	86	82	86	88	88	82	76	78	80	80	80	82	80	80
16	72	74	74	74	78	80	80	80	82	84	90	86	82	86	82	82	84	82	80
17	88	90	92	92	98	96	96	92	90	84	80	80	84	86	82	84	84	80	82
18	92	90	92	92	94	94	98	96	90	92	84	88	86	86	86	84	84	88	86
19	72	74	69	74	69	60	86	92	84	86	86	84	82	84	80	80	84	82	82
20	84	88	88	90	88	90	94	90	96	90	82	86	82	82	86	80	80	86	86
21	78	74	74	70	70	64	68	68	98	80	82	86	86	86	86	86	86	86	86
22	78	78	76	86	86	90	90	90	86	88	76	82	74	76	78	78	76	74	74
23	80	88	86	88	90	92	94	84	76	74	80	72	76	80	82	82	80	84	88
24	86	86	78	78	76	76	72	76	74	74	76	70	70	78	74	78	74	70	78
25	90	90	96	94	104	104	104	86	70	64	68	62	72	72	70	70	68	74	70
26	82	82	84	88	90	96	92	86	80	70	80	86	82	72	70	76	80	70	70
27	72	76	78	70	70	60	68	68	70	72	74	78	76	74	80	86	84	82	82
28	78	74	68	74	68	60	68	62	66	70	72	70	78	78	72	84	84	82	84
29	80	88	86	88	90	92	94	84	76	74	80	72	76	80	82	82	80	84	88
30	72	74	74	74	78	80	80	80	82	84	90	86	82	86	82	82	84	82	80

RR

S.NO	PREOP	OMIN	1MIN	3MIN	5MIN	10MIN	15MIN	30MIN	45MIN	60MIN	90MIN	120MIN	180MIN	240MIN	300MIN	360MIN	8HR	12HR	24HR
1	14	14	16	16	18	16	16	16	14	12	12	12	14	14	14	14	14	14	14
2	12	16	16	16	16	16	16	16	16	16	14	14	14	14	14	14	14	16	16
3	14	16	14	16	16	16	14	16	14	14	14	16	14	14	14	14	14	14	16
4	12	14	12	12	14	14	16	14	14	14	14	14	16	14	16	18	18	16	16
5	14	14	12	14	14	12	16	16	18	18	18	18	14	12	12	12	10	14	14
6	16	16	16	16	16	16	16	14	14	14	12	12	14	14	14	14	14	14	14
7	12	14	14	14	14	14	12	12	12	12	12	14	12	14	14	12	12	12	12
8	16	16	16	18	18	16	18	14	14	14	14	12	14	14	12	16	12	12	14
9	14	14	12	14	16	14	16	16	14	12	12	12	12	12	12	12	14	14	14
10	14	14	16	16	14	14	14	14	12	14	16	14	14	14	14	14	14	16	16
11	12	12	14	16	16	14	14	14	16	14	14	16	14	14	14	12	12	16	16
12	14	12	12	12	14	14	12	14	14	12	12	12	12	12	12	16	14	16	14
13	14	14	14	16	14	16	14	16	16	16	16	16	16	16	16	14	14	14	14
14	12	14	14	14	16	14	14	14	14	14	12	14	14	14	14	16	16	16	16
15	14	14	12	14	16	16	14	16	14	14	16	16	16	16	14	16	16	14	16
16	14	12	12	14	16	16	14	16	14	14	16	16	16	16	14	16	16	14	16
17	14	14	14	16	14	16	14	14	16	12	14	12	12	14	14	14	14	16	16
18	16	16	16	16	16	12	14	14	16	16	16	16	16	14	14	14	14	14	14
19	14	12	12	12	12	12	12	14	14	14	14	14	16	14	12	14	12	14	14
20	14	14	12	12	16	16	16	16	14	14	12	12	12	14	14	14	14	14	16
21	16	14	10	12	14	14	16	14	14	14	14	12	14	12	12	12	14	14	14
22	12	12	14	12	12	12	14	12	12	14	12	12	12	12	14	14	14	14	14
23	12	12	14	14	14	14	12	14	12	12	12	12	12	12	14	14	14	14	14
24	16	16	14	14	12	12	16	14	14	14	12	14	12	12	12	14	14	14	14
25	16	14	14	12	14	14	14	14	12	12	14	14	14	12	12	14	14	14	14
26	12	12	14	14	16	14	14	14	14	14	14	14	14	12	12	12	12	14	14
27	12	12	12	14	14	12	12	14	14	14	14	16	14	16	16	16	16	14	14
28	12	12	12	14	14	12	12	12	16	16	16	14	16	14	14	14	12	12	12
29	14	12	14	14	14	12	12	12	14	16	14	12	12	14	14	16	16	16	14
30	14	12	12	14	16	16	14	16	14	14	16	16	16	16	14	16	16	14	16

SBP																			
S.NO	PREOP	0MIN	1MIN	3MIN	5MIN	10MIN	15MIN	30MIN	45MIN	60MIN	90MIN	120MIN	180MIN	240MIN	300MIN	360MIN	8HR	12HR	24HR
1	100	108	102	104	108	108	108	118	120	120	120	120	122	110	116	110	120	120	120
2	120	120	110	100	100	100	102	104	104	102	104	110	112	110	110	104	110	110	120
3	138	130	126	110	110	100	112	112	112	110	114	110	112	110	120	110	110	130	130
4	130	118	116	116	110	118	110	108	110	110	110	110	110	120	120	124	120	120	120
5	120	112	108	100	118	112	110	110	112	110	110	110	110	112	118	110	120	122	120
6	120	110	104	100	110	112	110	112	102	110	112	110	110	110	110	110	118	118	116
7	122	118	100	108	110	108	102	102	100	112	110	110	110	110	120	124	130	126	128
8	112	116	104	108	100	102	100	106	104	110	110	120	120	126	122	116	120	120	124
9	118	118	110	86	100	100	100	102	110	120	124	120	120	120	120	120	122	130	130
10	112	110	100	100	100	100	104	100	110	110	110	116	126	120	120	120	124	124	126
11	130	112	108	100	118	112	104	124	120	120	120	112	118	110	120	120	122	126	130
12	126	118	108	120	100	106	104	100	110	110	110	120	120	130	126	126	120	134	130
13	114	114	114	104	114	140	112	108	110	110	110	110	108	110	110	108	114	120	120
14	130	130	110	110	104	100	100	104	120	124	114	122	120	126	124	126	120	128	128
15	120	120	118	120	110	108	108	110	104	106	110	108	110	114	122	120	120	130	126
16	110	110	110	110	112	106	110	108	100	104	104	112	110	110	110	110	114	114	120
17	130	130	110	110	110	110	110	104	110	110	120	120	124	122	124	120	120	120	122
18	140	138	118	120	110	100	130	128	120	120	120	120	120	120	120	118	122	120	120
19	138	110	108	110	108	106	112	104	110	112	110	110	110	112	110	120	110	124	124
20	130	120	120	122	120	122	118	118	116	118	120	122	124	120	120	120	124	120	120
21	130	120	124	120	110	106	106	100	106	106	110	108	112	110	108	110	110	118	120
22	122	120	122	120	122	122	110	106	110	110	112	108	110	110	116	110	120	120	120
23	118	110	110	108	110	110	102	110	110	110	110	112	110	122	120	120	124	124	130
24	112	114	114	104	104	104	110	114	120	120	120	120	120	122	124	128	124	120	120
25	110	110	108	108	108	108	102	108	110	120	110	120	118	112	110	110	112	120	120
26	140	136	120	116	110	116	120	120	118	130	124	120	110	118	120	124	120	110	110
27	150	130	120	120	126	120	110	118	124	110	104	110	112	112	118	122	126	130	130
28	124	120	120	110	116	114	110	120	108	108	110	118	112	114	120	118	122	120	110
29	120	120	122	120	122	122	110	106	100	106	110	108	112	110	108	110	100	102	106
30	110	110	110	110	112	106	110	108	100	104	104	112	110	110	110	110	114	114	120

DBP																			
S.NO	PREOP	0MIN	1MIN	3MIN	5MIN	10MIN	15MIN	30MIN	45MIN	60MIN	90MIN	120MIN	180MIN	240MIN	300MIN	360MIN	8HR	12HR	24HR
1	62	64	68	62	56	56	54	68	70	70	70	80	82	78	80	80	70	70	70
2	84	76	70	64	60	56	60	60	64	60	60	68	70	60	62	60	60	66	68
3	86	80	76	64	64	62	64	64	64	60	64	70	76	70	72	72	70	70	70
4	84	58	58	60	62	58	70	70	70	64	62	60	60	60	64	64	62	62	62
5	70	66	52	50	62	64	60	62	64	70	72	80	74	80	74	70	74	78	78
6	80	62	60	50	68	64	60	54	52	62	62	60	62	68	70	60	74	70	70
7	80	80	50	52	60	56	50	50	52	74	70	74	70	72	82	80	70	72	72
8	68	70	56	56	56	58	52	54	60	62	60	60	60	70	64	70	68	70	70
9	64	62	60	56	64	50	52	54	54	60	62	64	70	76	70	72	76	80	80
10	80	80	68	50	56	50	56	58	62	60	62	64	68	80	74	70	74	80	80
11	80	76	78	52	62	60	60	60	62	60	68	76	74	70	70	80	74	80	80
12	84	72	66	86	54	60	66	64	64	60	64	60	70	80	84	80	80	74	70
13	80	80	80	52	82	80	68	50	56	60	60	62	60	60	70	72	62	78	76
14	70	72	70	64	62	60	54	64	66	62	64	66	72	70	72	70	72	70	70
15	70	70	70	70	72	68	64	60	64	64	68	66	64	68	72	70	70	74	78
16	70	70	72	72	74	68	68	64	56	62	60	70	70	68	64	60	68	60	60
17	80	80	68	68	60	62	62	68	60	68	64	70	70	72	70	70	70	74	74
18	80	80	70	70	70	56	84	70	70	72	72	70	74	74	70	68	74	76	78
19	86	64	68	64	68	58	70	50	60	64	60	62	60	64	68	70	70	78	78
20	70	70	70	74	70	74	74	76	80	80	76	80	80	80	80	78	76	70	70
21	80	70	66	60	52	48	48	52	54	54	60	64	64	68	68	68	72	64	80
22	74	74	76	74	76	74	70	68	60	62	64	62	68	60	70	70	74	74	70
23	72	70	70	72	70	74	70	72	70	70	70	68	76	76	84	80	76	70	84
24	62	62	66	60	66	60	62	68	80	82	76	80	70	70	70	76	70	74	64
25	70	70	68	68	64	68	66	60	70	74	70	70	72	70	70	74	74	68	70
26	90	90	86	84	80	80	80	80	80	70	76	80	74	62	62	68	70	70	70
27	90	80	70	72	74	70	66	64	70	60	64	60	62	74	76	74	72	80	80
28	60	60	66	64	72	72	58	58	58	56	54	58	52	52	54	60	60	60	62
29	60	64	68	72	70	54	58	52	52	56	54	56	56	62	62	60	60	64	62
30	70	70	72	72	74	68	68	64	56	62	60	70	70	68	64	60	68	60	60

MAP																			
S.NO	PREOP	0MIN	1MIN	3MIN	5MIN	10MIN	15MIN	30MIN	45MIN	60MIN	90MIN	120MIN	180MIN	240MIN	300MIN	360MIN	8HR	12HR	24HR
1	74.66667	78.66667	79.33333	76	73.33333	73.33333	72	84.66667	86.66667	86.66667	86.66667	93.33333	95.33333	88.66667	92	90	86.66667	86.66667	86.66667
2	96	90.66667	83.33333	76	73.33333	70.66667	74	74.66667	77.33333	74	74.66667	82	84	76.66667	78	74.66667	76.66667	80.66667	85.33333
3	103.3333	96.66667	92.66667	79.33333	79.33333	74.66667	80	80	80	76.66667	80.66667	83.33333	88	83.33333	88	84.66667	83.33333	90	90
4	99.33333	78	77.33333	78.66667	78	78	83.33333	82.66667	83.33333	79.33333	78	76.66667	76.66667	80	82.66667	84	81.33333	81.33333	81.33333
5	86.66667	81.33333	70.66667	66.66667	80.66667	80	76.66667	78	80	83.33333	84.66667	90	86	90.66667	88.66667	83.33333	89.33333	92.66667	92
6	93.33333	78	74.66667	66.66667	82	80	76.66667	73.33333	68.66667	78	78.66667	76.66667	78	82	83.33333	76.66667	88.66667	86	85.33333
7	94	92.66667	66.66667	70.66667	76.66667	73.33333	67.33333	67.33333	68	86.66667	83.33333	86	83.33333	84.66667	94.66667	94.66667	90	90	85.33333
8	82.66667	85.33333	72	73.33333	70.66667	72.66667	68	71.33333	74.66667	78	76.66667	80	80	88.66667	83.33333	85.33333	85.33333	86.66667	90.66667
9	82	80.66667	76.66667	66	76	66.66667	68	70	72.66667	80	82.66667	82.66667	86.66667	90.66667	86.66667	88	91.33333	96.66667	88
10	90.66667	90	78.66667	66.66667	70.66667	66.66667	72	72	78	76.66667	78	81.33333	87.33333	93.33333	89.33333	86.66667	90.66667	94.66667	96.66667
11	96.66667	88	88	68	80.66667	77.33333	74.66667	81.33333	81.33333	80	85.33333	88	88.66667	83.33333	86.66667	93.33333	90	95.33333	95.33333
12	98	87.33333	80	97.33333	69.33333	75.33333	78.66667	76	79.33333	76.66667	79.33333	80	86.66667	96.66667	98	95.33333	93.33333	94	96.66667
13	91.33333	91.33333	91.33333	69.33333	92.66667	100	82.66667	69.33333	74	76.66667	76.66667	78	76	76.66667	83.33333	84	79.33333	92	90
14	90	91.33333	83.33333	79.33333	76	73.33333	69.33333	77.33333	84	82.66667	80.66667	84.66667	88	88.66667	89.33333	88.66667	88	89.33333	90.66667
15	86.66667	86.66667	86	86.66667	84.66667	81.33333	78.66667	76.66667	77.33333	78	82	80	79.33333	83.33333	88.66667	86.66667	86.66667	92.66667	89.33333
16	83.33333	83.33333	84.66667	84.66667	86.66667	80.66667	82	78.66667	70.66667	76	74.66667	84	83.33333	82	79.33333	76.66667	83.33333	78	94
17	96.66667	96.66667	82	82	76.66667	78	78	80	76.66667	82	82.66667	86.66667	88	88.66667	88	86.66667	86.66667	89.33333	80
18	100	99.33333	86	86.66667	83.33333	70.66667	99.33333	89.33333	86.66667	88	88	86.66667	89.33333	89.33333	86.66667	84.66667	90	90.66667	90
19	103.3333	79.33333	81.33333	79.33333	81.33333	74	84	68	76.66667	80	76.66667	78	76.66667	80	82	86.66667	83.33333	93.33333	92
20	90	86.66667	86.66667	90	86.66667	90	88.66667	90	92	92.66667	90.66667	94	94.66667	93.33333	93.33333	92	92	86.66667	93.33333
21	96.66667	86.66667	85.33333	80	71.33333	67.33333	67.33333	68	71.33333	71.33333	76.66667	78.66667	80	82	81.33333	82	84.66667	82	86.66667
22	90	89.33333	91.33333	89.33333	91.33333	90	83.33333	80.66667	76.66667	78	80	77.33333	82	76.66667	85.33333	83.33333	89.33333	89.33333	93.33333
23	87.33333	83.33333	83.33333	84	83.33333	86	80.66667	84.66667	83.33333	83.33333	83.33333	82.66667	87.33333	91.33333	96	93.33333	92	88	86.66667
24	78.66667	79.33333	82	74.66667	78.66667	74.66667	78	83.33333	93.33333	94.66667	90.66667	93.33333	86.66667	87.33333	88	93.33333	88	89.33333	99.33333
25	83.33333	83.33333	81.33333	81.33333	78.66667	81.33333	78	76	83.33333	89.33333	83.33333	86.66667	87.33333	84	83.33333	86	86.66667	85.33333	82.66667
26	106.6667	105.3333	97.33333	94.66667	90	92	93.33333	93.33333	92.66667	90	92	93.33333	86	80.66667	81.33333	86.66667	86.66667	83.33333	86.66667
27	110	96.66667	86.66667	88	91.33333	86.66667	80.66667	82	88	76.66667	77.33333	76.66667	78.66667	86.66667	90	90	90	96.66667	83.33333
28	81.33333	80	84	79.33333	86.66667	86	75.33333	78.66667	74.66667	73.33333	72.66667	78	72	72.66667	76	79.33333	80.66667	80	96.66667
29	80	82.66667	86	88	87.33333	76.66667	75.33333	70	68	72.66667	72.66667	73.33333	74.66667	78	77.33333	76.66667	73.33333	76.66667	78
30	83.33333	83.33333	84.66667	84.66667	86.66667	80.66667	82	78.66667	70.66667	76	74.66667	84	83.33333	82	79.33333	76.66667	83.33333	78	80

VAS														RSS												
S.NO	0HR	1HR	2HR	3HR	4HR	5HR	6HR	8HR	10HR	12HR	16HR	20HR	24HR	0HR	1HR	2HR	3HR	4HR	5HR	6HR	8HR	10HR	12HR	16HR	20HR	24HR
1	8	0	0	0	0	0	0	2	2	1	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
2	8	0	0	0	0	0	1	2	3	1	1	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
3	8	0	0	0	0	0	0	0	2	1	1	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
4	8	0	0	0	0	0	0	1	1	2	1	2	2	1	2	2	2	3	3	3	3	3	3	3	2	2
5	7	0	0	0	0	0	0	2	3	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2
6	7	0	0	0	0	0	0	1	2	3	2	2	2	1	2	3	3	2	2	2	2	2	2	2	2	2
7	8	0	0	0	0	0	0	2	3	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
8	8	0	0	0	0	0	1	3	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
9	7	0	0	0	0	0	0	0	2	1	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
10	8	0	0	0	0	0	0	0	0	2	1	1	2	1	2	2	2	2	2	3	3	3	3	2	2	2
11	8	0	0	0	0	0	0	2	2	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2
12	8	0	0	0	0	0	0	0	2	3	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
13	8	0	0	0	0	0	0	2	3	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
14	8	0	0	0	0	0	0	0	0	1	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
15	8	0	0	0	0	0	0	0	1	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
16	8	0	0	0	0	0	0	0	2	3	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
17	8	0	0	0	0	0	0	1	1	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
18	8	0	0	0	0	0	0	1	3	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2
19	8	0	0	0	0	0	0	1	1	3	1	1	1	1	2	2	2	3	3	3	3	2	2	2	2	2
20	8	0	0	0	0	0	1	1	1	3	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
21	8	0	0	0	0	0	0	1	2	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2
22	8	0	0	0	0	0	0	1	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
23	7	0	0	0	0	0	0	0	2	1	1	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
24	8	0	0	0	0	0	1	3	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
25	8	0	0	0	0	0	1	3	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
26	7	0	0	0	0	0	0	2	2	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2
27	8	0	0	0	0	0	0	2	1	1	1	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
28	8	0	0	0	0	0	0	0	1	3	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
29	8	0	0	0	0	0	0	0	1	3	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
30	8	0	0	0	0	0	0	0	1	3	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2

S.NO	ONSET		DURATION	APGAR SCORE		CCOMPLICATIONS					
	SENSORY	MOTOR	ANALGESIA	1MIN	5MIN	PONV	PRURITUS	HYPOTENSION	BRADYCARDIA	DROWSINESS	RESPIRATORY DEPRESSION
1	120	225	530	8	9	2	2	2	2	2	2
2	90	170	620	7	8	2	2	2	2	2	2
3	120	130	690	8	9	1	2	2	2	2	2
4	130	275	770	8	9	2	2	2	2	1	2
5	135	270	600	8	9	2	2	2	2	2	2
6	105	240	700	8	9	2	2	2	2	1	2
7	135	185	614	8	9	1	2	2	2	2	2
8	102	160	455	6	8	2	2	2	2	2	2
9	92	300	645	7	9	2	2	1	2	2	2
10	58	70	815	8	9	2	2	2	2	1	2
11	55	75	665	8	9	1	2	2	2	2	2
12	105	192	720	7	8	2	2	2	2	2	2
13	135	180	550	6	8	2	2	2	2	2	2
14	55	160	800	8	9	2	2	2	2	2	2
15	105	165	815	8	9	2	2	2	2	2	2
16	60	108	740	8	9	2	2	2	2	2	2
17	100	136	700	8	9	2	2	2	2	2	2
18	65	120	640	8	9	1	2	2	2	2	2
19	105	162	795	7	9	2	2	2	2	1	2
20	50	105	730	8	9	2	2	2	2	2	2
21	75	120	665	8	9	2	2	2	2	2	2
22	80	100	510	8	9	2	2	2	2	2	2
23	95	135	670	8	9	1	2	2	2	2	2
24	105	130	600	8	9	1	2	2	2	2	2
25	192	300	480	8	9	2	2	2	2	2	2
26	75	115	585	7	9	2	2	2	2	2	2
27	75	135	615	8	9	2	2	2	2	2	2
28	58	128	640	8	9	2	2	2	2	2	2
29	66	150	700	8	9	2	2	2	2	2	2
30	60	180	730	8	9	2	2	2	2	2	2

SpO2

S.NO	pre	0min	1min	3min	5min	10min	15min	30min	45min	60min	45min	90min	120min	180min	240min	300min	360min	8hr	12hr	24hr
1	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
2	99	99	100	100	100	100	100	100	99	99	99	98	99	99	99	99	99	99	98	99
3	99	99	99	99	99	100	100	100	100	100	100	100	100	100	99	98	99	99	99	99
4	99	99	99	99	99	99	99	99	99	98	97	98	98	98	98	99	99	99	99	99
5	99	99	99	99	99	99	99	99	99	99	99	97	98	99	98	98	98	98	98	99
6	99	99	99	100	100	100	100	100	100	100	99	99	99	99	99	99	99	99	99	99
7	99	99	99	99	99	99	99	99	99	99	99	99	98	98	99	99	99	99	99	99
8	99	99	98	99	99	99	99	99	98	98	99	99	99	99	99	99	99	99	99	99
9	99	99	98	98	98	98	98	98	99	98	98	100	100	100	99	99	99	99	99	99
10	99	99	99	99	98	98	99	99	99	98	99	99	98	98	99	99	99	99	99	99
11	99	99	99	99	98	98	98	98	97	977	97	98	99	99	99	99	99	98	99	99
12	99	99	98	98	98	98	98	98	98	98	99	98	98	98	98	98	98	98	98	98
13	99	99	99	99	99	98	98	97	97	97	97	97	99	99	99	99	99	99	99	99
14	99	99	99	99	98	98	99	99	99	98	99	99	99	99	99	99	99	99	99	99
15	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
16	99	99	99	100	100	100	100	100	100	100	99	100	99	100	99	100	99	99	99	99
17	99	99	99	99	100	100	100	100	100	100	100	100	99	99	99	100	100	100	100	100
18	99	99	99	100	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
19	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
20	99	99	99	99	100	100	100	100	99	99	98	99	99	99	99	99	99	99	98	98
21	99	99	99	100	98	98	97	97	97	98	99	99	99	99	99	99	98	99	99	99
22	99	99	99	100	99	98	98	97	99	99	99	99	99	99	98	98	98	98	98	98
23	99	99	99	100	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
24	99	99	99	99	99	98	99	99	99	99	99	99	99	99	99	99	99	99	99	99
25	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	98	98	98
26	99	99	99	99	99	99	99	99	99	98	98	99	99	99	99	99	99	99	99	99
27	99	99	99	99	100	99	99	99	99	99	99	99	97	97	97	99	99	98	98	99
28	99	99	99	99	100	98	99	99	99	97	97	98	98	98	98	99	98	98	99	99
29	99	99	99	99	98	99	99	99	99	98	99	99	99	99	99	99	99	98	99	99
30	99	99	99	99	100	100	99	99	99	99	99	99	99	99	99	99	99	99	99	99

CONTROL GROUP-basal															
S.NO	NAME	AGE	SEX	WEIGHT	HEIGHT	DIAGNOSIS	ASA	DRUG	RSS	VAS	PULSE	RR	SBP	DBP	MAP	SPO2
1	Sumathi	20	FEMALE	66	156	primi/oligohydramnios	1	2	1	8	78	16	120	62	81.33333	99
2	Rusidha ramzuni	22	FEMALE	66	154	previous lscs	1	2	1	7	86	12	120	76	90.66667	99
3	Nithya	25	FEMALE	58	152	previous lscs	1	2	1	7	74	14	130	76	94	99
4	Sathya vani	25	FEMALE	64	156	previous lscs	1	2	1	8	80	12	130	86	100.6667	99
5	Rafia	21	FEMALE	70	158	Primi/preeclampsia	2	2	1	8	76	16	150	90	110	99
6	Gayathri	24	FEMALE	64	160	previous lscs	1	2	1	7	76	14	120	80	93.33333	99
7	Vijayalaxmi	35	FEMALE	68	158	previous lscs	1	2	1	7	84	16	120	70	86.66667	99
8	Sudarvizhi	27	FEMALE	58	152	previous lscs	1	2	1	8	82	18	134	92	106	99
9	MOHAVLU Fathima	25	FEMALE	68	154	previous lscs/anaemia	2	2	1	8	72	18	140	90	106.6667	99
10	Vasanthi	24	FEMALE	64	150	previous lscs	1	2	1	8	90	18	140	90	106.6667	99
11	Sangeetha	24	FEMALE	76	160	previous lscs	1	2	1	8	84	18	120	80	93.33333	99
12	Stella	28	FEMALE	68	162	previous lscs/anaemia	2	2	1	8	76	18	130	70	90	99
13	Meena	20	FEMALE	70	156	primi/mobile head	1	2	1	8	80	14	130	70	90	99
14	Sabina banu	28	FEMALE	74	154	previous lscs	1	2	1	8	84	14	120	80	93.33333	99
15	Sangeetha	27	FEMALE	64	152	previous lscs	1	2	1	7	80	14	130	80	96.66667	99
16	Thara banu	25	FEMALE	66	158	previous lscs	1	2	1	7	88	18	130	94	106	99
17	Punitha	24	FEMALE	68	160	G2/Polyhydramnios	1	2	1	8	86	18	140	80	100	99
18	Saranya	20	FEMALE	74	160	previous lscs	1	2	1	7	80	16	130	80	96.66667	99
19	Anjali	19	FEMALE	68	156	primi/mobile head	1	2	1	8	72	12	120	82	94.66667	99
20	Geetha devi	23	FEMALE	58	152	primi/PIH	2	2	1	8	80	16	120	66	84	99
21	Karthigai vani	20	FEMALE	58	152		2	2	1	8	72	16	120	60	80	99
22	Valliammal	30	FEMALE	62	156	previous lscs	1	2	1	8	84	14	130	68	88.66667	99
23	Sithi sabinabanu	24	FEMALE	64	160	primi/PIH	2	2	1	8	72	16	120	80	93.33333	99
24	Mythili	30	FEMALE	64	156	previous lscs	1	2	1	8	84	12	130	90	103.3333	99
25	Saraswathy	27	FEMALE	70	150	primi/bigbaby	2	2	1	8	72	14	120	82	94.66667	99
26	Ramalaxmi	25	FEMALE	64	162	previous lscs	1	2	1	8	70	16	130	70	90	99
27	Chithra	25	FEMALE	60	154	primi/PIH	2	2	1	8	78	16	140	90	106.6667	99
28	Suseela	24	FEMALE	68	155	previous lscs	1	2	1	8	74	16	130	80	96.66667	99
29	Nandhini	28	FEMALE	65	155	G2/mobile head	1	2	1	8	84	14	140	90	106.6667	99
30	Devi	23	FEMALE	70	158	previous lscs	1	2	1	8	70	16	120	80	93.33333	99

	PULSE																		
S.NO	PRE	0MIN	1MIN	3MIN	5MIN	10MIN	15MIN	30MIN	45MIN	60MIN	90MIN	120MIN	180MIN	240MIN	300MIN	360MIN	8HR	12HR	24HR
1	78	76	88	90	86	88	84	84	80	84	80	86	84	88	84	80	80	82	82
2	86	82	82	86	80	88	88	96	92	86	88	86	84	86	86	80	80	76	76
3	74	74	76	74	76	74	78	92	92	90	88	90	90	88	84	86	84	82	82
4	80	84	80	80	80	82	76	80	84	84	80	86	80	90	80	84	88	84	84
5	76	78	78	80	90	96	90	92	90	86	82	96	84	80	72	74	70	76	76
6	76	78	78	76	72	90	92	96	94	90	84	84	82	86	80	80	76	70	70
7	84	86	88	90	90	88	90	90	84	84	80	84	82	84	78	76	78	74	74
8	82	84	80	80	86	86	88	86	86	86	86	80	80	80	70	70	72	70	72
9	72	78	74	78	78	90	92	86	88	88	96	84	88	82	84	89	84	84	84
10	90	88	98	98	98	94	90	90	90	80	86	80	86	80	76	70	70	72	70
11	84	82	80	86	86	86	86	84	86	80	78	80	80	80	70	72	70	70	70
12	76	76	84	84	86	84	86	84	82	80	88	86	88	94	86	84	80	80	84
13	80	84	84	88	80	88	92	90	92	98	76	72	80	80	84	80	80	74	74
14	84	88	88	90	90	90	92	96	80	84	70	78	82	76	68	70	64	76	76
15	80	82	84	88	90	90	90	82	82	78	82	80	82	80	70	70	72	72	70
16	88	88	80	86	86	86	88	84	86	86	86	88	88	78	74	78	76	76	76
17	86	88	94	94	90	90	98	96	92	86	88	86	88	80	72	70	70	70	70
18	80	84	88	88	88	90	92	86	84	80	80	86	84	80	72	72	70	70	70
19	72	74	74	78	78	98	90	94	94	86	86	86	86	76	80	72	70	70	70
20	80	86	86	94	94	94	98	98	90	90	90	92	90	84	74	72	70	74	74
21	72	74	78	86	86	88	90	88	80	80	84	70	80	70	70	70	72	72	72
22	84	88	86	884	84	82	88	86	74	80	80	88	80	80	74	86	86	80	80
23	72	76	76	78	90	92	90	86	92	86	80	86	70	70	68	76	76	74	74
24	84	88	98	96	96	96	90	86	82	84	84	86	76	78	74	72	70	74	74
25	72	74	74	74	74	78	90	90	94	94	84	86	84	84	80	76	72	72	72
26	70	76	88	88	88	90	90	86	86	86	82	80	80	86	86	80	80	82	82
27	78	80	80	88	88	86	80	80	70	72	70	78	80	76	70	70	72	78	78
28	74	78	88	96	102	106	98	94	90	90	84	80	84	80	70	70	70	72	72
29	84	88	90	90	88	86	88	90	90	88	82	82	86	80	76	70	80	80	80
30	70	74	72	80	86	86	86	88	82	88	84	88	80	82	80	80	70	70	70

RR

S.NO	PREOP	OMIN	1MIN	3MIN	5MIN	10MIN	15MIN	30MIN	45MIN	60MIN	90MIN	120MIN	180MIN	240MIN	300MIN	360MIN	8HR	12HR	24HR
1	16	16	18	18	18	20	18	16	18	18	18	18	20	18	18	16	18	18	18
2	12	14	14	16	14	14	14	12	14	14	16	18	18	18	18	16	18	18	18
3	14	14	14	14	16	16	14	14	16	14	12	14	14	14	14	18	18	20	20
4	12	12	12	12	12	12	14	14	14	12	14	14	16	14	14	12	12	12	12
5	16	16	14	14	16	16	14	14	14	12	12	18	18	18	16	14	16	16	16
6	14	14	14	16	14	14	12	16	16	14	16	18	18	16	16	14	14	16	14
7	16	18	16	16	18	16	16	16	16	16	16	16	16	14	16	16	16	18	18
8	18	18	16	18	18	16	16	18	18	16	18	18	18	16	16	16	16	16	14
9	18	16	18	18	16	16	16	16	18	16	16	16	16	14	14	14	14	16	16
10	18	18	18	20	20	20	20	16	18	20	18	18	18	14	16	14	14	14	16
11	18	20	20	20	20	20	18	20	20	20	18	18	16	14	14	14	19	20	20
12	18	18	18	18	16	18	18	18	18	16	18	18	18	16	16	16	14	14	18
13	14	14	14	14	14	14	14	16	16	14	12	12	14	16	16	12	14	14	14
14	14	14	12	12	14	14	16	16	16	16	16	16	16	14	12	16	14	14	14
15	14	14	14	12	12	12	14	14	16	16	16	14	14	14	14	16	16	16	16
16	18	18	18	18	16	16	16	18	20	20	20	16	16	14	16	14	16	16	16
17	18	18	18	18	18	18	16	16	18	16	16	18	16	16	14	16	16	14	16
18	16	16	14	16	16	14	14	14	16	16	16	16	16	18	14	16	16	14	16
19	12	14	14	14	14	14	12	14	14	14	16	16	16	14	16	16	14	14	14
20	16	16	18	16	16	16	14	14	14	16	16	16	16	16	14	16	16	14	14
21	16	16	16	16	18	16	14	14	14	16	14	12	14	14	14	14	14	14	14
22	14	14	14	16	16	16	18	18	18	16	16	16	16	16	14	14	14	14	14
23	16	16	16	18	18	18	16	18	16	18	18	18	18	14	14	14	14	14	14
24	12	14	14	14	16	16	16	14	16	14	16	16	16	16	16	16	16	16	16
25	14	14	14	14	12	14	16	14	16	16	16	14	18	16	16	14	12	16	16
26	16	18	18	18	18	18	18	18	16	14	16	16	18	14	16	14	14	14	14
27	16	16	18	18	16	16	18	16	16	14	14	16	14	16	16	14	14	16	14
28	16	16	16	16	18	18	18	18	18	18	18	18	18	16	14	14	14	16	16
29	14	14	14	14	16	14	16	16	16	14	14	16	14	14	14	12	14	14	14
30	16	16	14	14	16	18	18	16	18	18	16	16	14	14	14	14	14	14	14

	SBP																		
S.NO	PREOP	0MIN	1MIN	3MIN	5MIN	10MIN	15MIN	30MIN	45MIN	60MIN	90MIN	120MIN	180 MIN	240MIN	300MIN	360MIN	8HR	12HR	24HR
1	120	120	110	110	108	100	108	108	110	110	110	118	120	124	120	128	126	130	130
2	120	120	120	100	100	102	100	110	102	110	122	120	126	130	122	120	120	120	122
3	130	120	120	118	118	114	118	110	110	112	110	110	122	120	134	132	130	130	130
4	130	118	118	120	120	120	118	120	110	120	122	124	130	132	126	120	128	130	130
5	150	130	130	126	130	112	110	108	118	110	120	124	120	128	120	120	124	122	124
6	120	120	120	120	120	100	100	110	112	110	110	110	120	130	124	120	122	120	120
7	120	120	102	102	100	110	90	100	106	102	110	112	120	126	124	124	130	132	132
8	134	136	130	120	110	110	100	120	110	110	110	118	120	116	116	110	110	118	116
9	140	140	130	126	110	110	110	108	110	110	110	120	124	120	122	126	128	130	130
10	140	130	120	122	120	120	108	108	112	110	110	110	120	110	110	110	110	110	110
11	120	112	110	104	102	104	104	110	118	110	108	110	110	112	120	110	112	120	120
12	130	124	110	110	104	104	104	108	108	110	112	118	122	120	120	112	110	124	130
13	130	130	120	120	112	112	110	102	104	110	120	112	110	120	120	130	130	120	120
14	120	120	112	102	102	100	96	106	110	112	120	110	102	124	110	112	110	120	120
15	130	110	112	110	110	104	100	104	104	110	120	118	116	114	118	120	110	110	110
16	130	130	126	126	120	120	120	120	110	120	124	122	120	110	112	120	120	120	120
17	140	130	110	110	110	108	108	110	110	120	120	120	130	120	124	122	130	130	130
18	130	130	110	100	102	100	90	106	110	106	108	110	120	110	110	118	120	120	118
19	120	120	112	110	110	110	100	96	108	116	120	120	128	122	120	122	120	120	120
20	120	120	110	110	110	110	104	110	116	120	116	122	124	126	124	118	110	110	110
21	120	120	124	110	108	108	106	102	110	116	122	120	110	120	124	124	124	120	120
22	130	120	110	110	110	110	112	112	118	120	120	124	120	120	120	120	120	120	120
23	120	120	104	103	103	110	110	110	108	110	100	110	110	124	120	110	120	120	120
24	130	108	108	110	110	108	100	108	110	110	120	120	120	110	110	120	120	120	120
25	120	120	112	112	112	110	112	108	110	106	110	112	112	110	108	110	110	110	110
26	130	120	122	110	110	112	110	110	118	122	118	110	130	126	120	120	120	120	120
27	140	138	110	110	102	100	104	102	112	110	120	124	120	124	122	128	126	120	128
28	130	124	110	110	90	108	104	104	110	110	120	120	110	110	120	120	120	110	110
29	140	136	120	120	120	108	104	102	104	110	110	124	120	120	120	120	120	120	120
30	120	120	110	110	112	100	102	110	1100	112	120	118	120	110	112	120	120	120	110

	DBP																		
S.NO	PREOP	0MIN	1MIN	3MIN	5MIN	10MIN	15MIN	30MIN	45MIN	60MIN	90MIN	120MIN	180MIN	240MIN	300MIN	360MIN	8HR	12HR	24HR
1	62	64	60	62	62	50	52	56	60	62	60	70	74	72	80	86	82	80	80
2	76	70	72	56	52	52	50	60	60	60	76	70	84	70	74	70	70	74	74
3	76	68	76	68	60	62	60	64	70	70	70	70	74	76	86	82	74	68	70
4	86	76	76	70	70	66	70	60	60	70	80	78	74	84	78	72	78	70	70
5	90	70	72	70	72	68	64	62	70	68	70	80	80	86	80	74	84	78	78
6	80	80	70	80	70	60	60	60	66	68	62	60	70	64	80	76	72	74	74
7	70	70	60	60	56	54	52	54	58	52	62	60	70	74	72	70	70	74	74
8	92	96	80	76	70	70	70	64	56	70	70	74	78	70	74	72	70	72	72
9	90	90	90	90	80	70	56	62	60	68	62	70	78	70	74	76	76	70	70
10	90	90	70	70	70	70	60	60	56	50	56	56	68	74	68	70	70	74	74
11	120	80	70	70	60	56	54	50	58	70	70	66	70	74	76	74	72	70	70
12	130	70	70	74	56	56	50	50	58	60	60	70	74	74	62	60	62	70	80
13	70	72	68	60	58	50	54	54	54	62	60	70	70	70	70	80	70	70	70
14	80	76	70	56	58	52	52	50	52	60	62	62	66	74	70	74	60	70	70
15	80	70	72	70	70	76	68	50	76	70	70	70	72	70	70	70	64	64	64
16	94	92	74	74	70	70	70	74	74	70	72	84	78	74	72	70	60	60	60
17	80	70	72	70	72	60	62	62	64	70	72	80	90	80	70	68	80	70	70
18	88	82	70	70	70	74	74	60	64	64	56	64	66	72	74	70	74	76	76
19	82	80	66	60	66	66	60	50	64	68	72	70	68	72	70	72	74	72	72
20	60	60	54	56	56	50	52	62	64	70	72	74	64	70	72	74	60	66	66
21	60	62	64	60	64	60	54	54	62	62	76	74	76	70	70	70	80	80	80
22	68	60	66	66	50	52	54	54	56	66	76	76	76	72	70	80	80	80	80
23	80	70	66	60	66	70	62	62	62	60	68	72	72	70	70	80	70	70	70
24	90	78	70	70	70	72	50	56	62	60	70	80	70	70	74	70	70	70	70
25	82	82	80	80	66	64	66	56	62	64	68	70	70	62	64	60	60	70	70
26	70	70	70	70	64	48	50	62	64	70	76	70	74	74	70	80	80	80	80
27	90	80	80	70	70	50	50	52	54	64	60	70	80	86	74	72	78	70	70
28	80	80	60	60	52	58	60	60	60	62	70	70	60	60	80	80	70	60	60
29	90	90	60	60	60	56	52	54	62	64	68	74	78	80	80	60	60	70	70
30	80	82	64	60	66	60	60	64	64	76	60	64	70	74	76	70	80	80	60

MAP																			
S.NO	PREOP	0MIN	1MIN	3MIN	5MIN	10MIN	15MIN	30MIN	45MIN	60MIN	90MIN	120MIN	180MIN	240MIN	300MIN	360MIN	8HR	12HR	24HR
1	81.33333	82.66667	76.66667	78	77.33333	66.66667	70.66667	73.33333	76.66667	78	76.66667	86	89.33333	89.33333	93.33333	100	96.66667	96.66667	96.66667
2	90.66667	86.66667	88	70.66667	68	68.66667	66.66667	76.66667	74	76.66667	91.33333	86.66667	98	90	90	86.66667	86.66667	89.33333	96.66667
3	94	85.33333	90.66667	84.66667	79.33333	79.33333	79.33333	79.33333	83.33333	84	83.33333	83.33333	90	90.66667	102	98.66667	92.66667	88.66667	90
4	100.6667	90	90	86.66667	86.66667	84	86	80	76.66667	86.66667	94	93.33333	92.66667	100	94	88	94.66667	90	90
5	110	90	91.33333	88.66667	91.33333	82.66667	79.33333	77.33333	86	82	86.66667	94.66667	93.33333	100	93.33333	89.33333	97.33333	92.66667	90
6	93.33333	93.33333	86.66667	93.33333	86.66667	73.33333	73.33333	76.66667	81.33333	82	78	76.66667	86.66667	86	94.66667	90.66667	88.66667	89.33333	93.33333
7	86.66667	86.66667	74	74	70.66667	72.66667	64.66667	69.33333	74	68.66667	78	77.33333	86.66667	91.33333	89.33333	88	90	93.33333	89.33333
8	106	109.3333	96.66667	90.66667	83.33333	83.33333	80	82.66667	74	83.33333	83.33333	88.66667	92	85.33333	88	84.66667	83.33333	87.33333	93.33333
9	106.6667	106.6667	103.3333	102	90	83.33333	74	77.33333	76.66667	82	78	86.66667	93.33333	86.66667	90	92.66667	93.33333	90	86.66667
10	106.6667	103.3333	86.66667	87.33333	86.66667	86.66667	76	76	74.66667	70	74	74	85.33333	86	82	83.33333	83.33333	86	90
11	120	90.66667	83.33333	81.33333	74	72	70.66667	70	78	83.33333	82.66667	80.66667	83.33333	86.66667	90.66667	86	85.33333	86.66667	86
12	74	88	83.33333	86	72	72	68	69.33333	74.66667	76.66667	77.33333	86	90	89.33333	81.33333	77.33333	78	88	86.66667
13	90	91.33333	85.33333	80	76	70.66667	72.66667	70	70.66667	78	80	84	83.33333	86.66667	86.66667	96.66667	90	86.66667	96.66667
14	93.33333	90.66667	84	71.33333	72.66667	68	66.66667	68.66667	71.33333	77.33333	81.33333	78	78	90.66667	83.33333	86.66667	76.66667	86.66667	86.66667
15	96.66667	83.33333	85.33333	83.33333	83.33333	85.33333	78.66667	68	85.33333	83.33333	86.66667	86	86.66667	84.66667	86	86.66667	79.33333	79.33333	86.66667
16	106	104.6667	91.33333	91.33333	86.66667	86.66667	86.66667	89.33333	86	86.66667	89.33333	96.66667	92	86	85.33333	86.66667	80	80	79.33333
17	100	90	84.66667	83.33333	84.66667	76	77.33333	78	79.33333	86.66667	88	93.33333	103.3333	93.33333	88	86	96.66667	90	80
18	102	98	83.33333	80	80.66667	82.66667	79.33333	75.33333	79.33333	78	73.33333	79.33333	84	84.66667	86	86	89.33333	90.66667	90
19	94.66667	93.33333	81.33333	76.66667	80.66667	80.66667	73.33333	65.33333	78.66667	84	88	86.66667	88	88.66667	86.66667	88.66667	89.33333	88	90
20	80	80	72.66667	74	74	70	69.33333	78	81.33333	86.66667	86.66667	90	84	88.66667	89.33333	88.66667	76.66667	80.66667	88
21	80	81.33333	84	76.66667	78.66667	76	71.33333	70	78	80	91.33333	89.33333	87.33333	86.66667	88	88	94.66667	93.33333	80.66667
22	88.66667	80	80.66667	80.66667	70	71.33333	73.33333	73.33333	76.66667	84	90.66667	92	90.66667	88	86.66667	93.33333	93.33333	93.33333	93.33333
23	93.33333	86.66667	78.66667	74.33333	78.33333	83.33333	78	78	77.33333	76.66667	78.66667	84.66667	84.66667	88	86.66667	90	86.66667	86.66667	93.33333
24	103.3333	88	82.66667	83.33333	83.33333	84	66.66667	73.33333	78	76.66667	86.66667	93.33333	86.66667	83.33333	86	86.66667	86.66667	86.66667	86.66667
25	94.66667	94.66667	90.66667	90.66667	81.33333	79.33333	81.33333	73.33333	78	78	82	84	84	78	78.66667	76.66667	76.66667	83.33333	86.66667
26	90	86.66667	87.33333	83.33333	79.33333	69.33333	70	78	82	87.33333	90	83.33333	92.66667	91.33333	86.66667	93.33333	93.33333	93.33333	76.66667
27	106.6667	99.33333	90	83.33333	80.66667	66.66667	68	68.66667	73.33333	79.33333	80	88	93.33333	98.66667	90	90.66667	94	86.66667	93.33333
28	96.66667	94.66667	76.66667	76.66667	64.66667	74.66667	74.66667	74.66667	76.66667	78	86.66667	86.66667	76.66667	76.66667	93.33333	93.33333	86.66667	76.66667	89.33333
29	106.6667	105.3333	80	80	80	73.33333	69.33333	70	76	79.33333	82	90.66667	92	93.33333	93.33333	80	80	86.66667	76.66667
30	93.33333	94.66667	79.33333	76.66667	81.33333	73.33333	74	79.33333	409.3333	88	80	82	86.66667	86	88	86.66667	93.33333	93.33333	86.66667

	VAS													RSS											
S.NO	0HR	1HR	2HR	3HR	4HR	5HR	6HR	8HR	10HR	12HR	16HR	20HR	24HR	0HR	1HR	2HR	3HR	4HR	5HR	6HR	8HR	10HR	12HR	16HR	20HR	24HR
1	8	0	2	3	2	6	3	2	2	6	4	3	4	1	2	2	2	1	2	2	2	2	2	2	2	2
2	8	0	0	3	2	4	2	4	6	2	3	3	3	1	2	2	2	1	2	2	2	1	2	2	1	2
3	8	0	0	2	4	2	2	4	3	3	6	2	3	1	2	2	2	1	2	2	1	2	2	1	2	2
4	8	0	2	4	2	2	7	3	2	2	3	2	2	1	2	2	2	1	1	2	2	2	2	1	2	2
5	8	0	0	2	3	2	4	4	6	3	3	4	3	1	2	2	2	2	1	2	2	2	1	2	2	2
6	7	0	0	1	2	4	2	2	4	4	6	3	2	1	2	2	2	2	1	2	2	2	1	2	2	2
7	7	0	0	3	2	2	4	2	2	3	3	2	2	1	2	2	1	1	2	1	1	2	2	1	1	2
8	8	0	2	3	2	4	4	3	2	2	4	3	3	1	2	2	2	1	1	2	2	2	2	2	1	2
9	8	0	0	2	2	4	3	4	4	3	3	4	4	1	2	2	2	2	2	2	2	2	1	2	2	2
10	8	0	0	3	2	2	4	4	3	3	3	4	4	1	2	2	2	2	1	2	1	1	2	2	2	2
11	8	0	0	3	2	2	3	3	4	4	3	4	3	1	2	2	2	2	1	2	2	2	1	1	2	2
12	8	0	0	3	3	3	5	5	3	5	4	4	4	1	2	2	2	2	1	2	2	1	2	2	2	2
13	8	0	0	2	4	2	3	3	4	2	4	4	4	1	2	2	2	2	1	2	1	2	2	1	2	2
14	8	0	1	3	3	3	5	5	3	3	5	4	4	1	2	2	1	2	2	2	1	2	2	2	1	2
15	7	0	2	3	3	3	4	4	4	4	4	4	4	1	2	2	1	1	2	2	2	2	1	2	2	2
16	7	0	0	1	3	3	3	4	4	4	5	5	5	1	2	2	2	1	2	2	2	2	1	2	2	2
17	8	0	0	3	3	3	3	4	4	4	4	4	4	1	2	2	2	1	2	2	1	1	2	2	2	2
18	7	0	0	3	3	4	4	5	4	4	4	6	6	1	2	2	2	1	2	2	2	1	2	2	2	2
19	8	0	0	2	3	3	4	4	4	4	4	4	4	1	2	2	2	2	1	2	2	1	2	2	2	2
20	8	0	0	2	3	3	4	4	5	5	5	5	5	1	2	2	2	1	2	2	2	1	2	2	2	2
21	8	0	0	3	3	4	3	4	4	5	5	4	4	1	2	2	2	2	1	1	2	2	2	1	2	2
22	7	0	0	1	3	3	3	3	5	5	6	5	5	1	2	2	2	2	2	1	2	2	1	2	2	2
23	7	0	1	3	3	4	4	4	4	5	5	5	5	1	2	2	2	2	2	2	1	2	2	2	2	2
24	8	0	0	1	3	4	4	4	5	5	5	5	5	1	2	2	2	2	1	2	2	1	2	2	2	2
25	8	0	0	2	3	3	4	4	4	4	4	4	4	1	2	2	2	2	2	2	1	2	2	1	2	2
26	8	0	0	2	3	3	3	4	4	4	5	5	5	1	2	2	2	2	2	1	2	2	2	1	2	2
27	8	0	1	3	3	3	3	4	4	4	4	4	4	1	2	2	2	1	1	2	2	2	2	2	2	2
28	8	0	0	2	4	4	4	4	5	5	6	6	6	1	2	2	2	2	1	2	2	2	2	1	2	2
29	8	0	0	1	3	3	3	3	5	5	5	6	6	1	2	2	2	2	2	2	1	2	1	2	2	2
30	8	0	1	3	3	3	4	4	4	4	6	6	6	1	2	2	1	2	2	1	1	2	2	2	2	2

	ONSET		DURATION	APGAR SCORE		CCOMPLICATIONS		COMPLICATIONS			
S.NO	SENSORY	MOTOR	ANALGESIA	1 MIN	5 MIN	PONV	PRURITUS	HYPOTENSION	BRADYCARDIA	DROWSINESS	RESPIRATORY DEPRESSION
1	195	240	180	7	9	2	2	2	2	2	2
2	210	240	187	7	9	1	2	2	2	2	2
3	150	240	205	7	8	2	2	2	2	2	2
4	135	240	165	8	9	2	2	1	2	2	2
5	180	210	210	8	9	2	2	2	2	2	2
6	200	226	275	8	9	2	2	2	2	2	2
7	252	300	165	8	9	2	2	2	2	2	2
8	252	300	190	7	9	2	2	2	2	2	2
9	200	240	190	7	9	1	2	2	2	2	2
10	175	220	195	7	9	2	2	2	2	2	2
11	185	240	195	7	8	2	2	2	2	2	2
12	190	300	180	7	8	2	2	2	2	2	2
13	165	215	195	8	9	1	2	2	2	2	2
14	312	360	190	8	9	2	2	2	2	2	2
15	225	260	165	7	9	1	2	1	2	2	2
16	240	300	215	7	9	2	2	2	2	2	2
17	205	240	174	8	9	2	2	2	2	2	2
18	200	255	152	8	9	2	2	2	2	2	2
19	270	300	190	8	9	2	2	2	2	2	2
20	225	264	190	8	9	2	2	2	2	2	2
21	260	300	173	6	8	2	2	2	2	2	2
22	210	270	200	7	9	2	2	2	2	2	2
23	240	270	180	7	9	1	2	2	2	2	2
24	230	275	210	8	9	2	2	2	2	2	2
25	230	255	225	6	8	2	2	2	2	2	2
26	180	310	200	7	9	2	2	2	2	2	2
27	150	180	180	7	9	2	2	1	2	2	2
28	190	280	180	7	9	2	2	2	2	2	2
29	165	210	195	8	9	2	2	2	2	2	2
30	165	255	170	8	9	2	2	2	2	2	2

	SpO2																		
S.NO	basal	0min	1min	3min	5min	10min	15min	30min	45min	60min	90min	120min	180min	240min	300min	360min	8hr	12hr	24hr
1	99	99	99	99	98	99	98	99	99	99	99	98	98	98	98	99	99	99	98
2	99	99	99	98	99	100	100	99	99	99	100	100	99	99	99	99	99	99	99
3	99	99	99	99	99	99	98	98	98	98	98	97	98	97	98	97	98	99	99
4	99	99	99	99	98	99	99	99	99	97	99	99	99	99	99	99	99	99	99
5	98	99	99	99	99	99	99	99	99	99	99	98	98	98	98	98	98	98	98
6	98	99	99	99	99	99	99	100	100	100	99	98	98	98	99	99	99	99	99
7	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	100	100	100	100
8	99	99	100	100	100	100	100	100	100	100	100	99	99	99	99	99	99	99	99
9	99	99	100	99	100	99	99	99	99	99	99	99	99	99	99	98	99	99	99
10	98	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	98	99	99
11	98	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	98	98
12	99	99	99	99	99	99	99	99	99	99	98	98	99	98	98	98	98	98	99
13	99	99	99	99	98	99	99	99	97	97	97	99	99	99	99	98	98	98	98
14	99	99	99	99	99	99	99	98	98	99	98	98	98	98	99	99	99	99	99
15	99	99	99	99	100	100	99	99	100	100	100	100	99	99	98	98	98	99	99
16	99	99	99	99	100	100	100	100	100	100	100	99	99	99	99	99	99	99	99
17	99	99	100	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
18	99	99	100	99	99	98	98	98	98	98	99	99	99	99	99	99	99	99	99
19	99	99	100	99	99	99	98	98	98	98	98	98	98	98	97	97	98	99	99
20	99	99	100	99	99	99	99	100	100	100	100	99	100	98	98	99	99	100	100
21	100	99	98	99	99	99	99	99	99	99	98	99	98	99	99	98	97	97	98
22	100	98	98	99	99	98	98	99	99	99	98	99	98	98	98	98	98	98	98
23	99	98	97	98	99	99	99	98	98	98	99	99	99	98	98	99	99	98	98
24	99	98	99	99	99	99	99	99	100	99	99	99	99	99	99	99	99	99	99
25	99	98	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	98
26	100	99	99	99	99	99	99	98	99	99	99	98	99	99	99	99	99	99	99
27	99	99	99	99	99	99	99	99	99	99	99	98	98	98	97	97	98	98	99
28	99	99	99	99	99	99	99	99	99	99	98	99	100	99	99	99	99	99	99
29	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
30	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99